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DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1982

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

FIRST SESSION

Part 4—Procurement/R.D.T. & E.

(Pages 1–774)

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CONTENTS

WEDNESDAY, MARCH 11, 1981

Department of Defense: Page
Acting Principal Deputy Under Secretary for Research and Engineering 1
Defense Advanced Research Projects Agency 18

MONDAY, MARCH 30, 1981

Department of Defense:
Department of the Army 135

WEDNESDAY, APRIL 8, 1981

Department of Defense:
Department of the Navy:
Shipbuilding and Conversion, Navy 295

THURSDAY, APRIL 9, 1981

Department of Defense:
Department of the Navy:
Aircraft and Weapons Procurement 417
U.S. Marine Corps 458

THURSDAY, APRIL 30, 1981

Department of Defense:
Department of the Navy:
Research, development, test and evaluation 527

THURSDAY, MAY 7, 1981

Department of Defense:
Department of the Air Force 615

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1982

WEDNESDAY, MARCH 11, 1981

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, D.C.

The subcommittee met at 9:15 a.m., in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, Andrews, Kasten, Rudman, and Stennis.

DEPARTMENT OF DEFENSE

RESEARCH, DEVELOPMENT, TEST AND EVALUATION OVERVIEW

STATEMENTS OF:

HON. JAMES P. WADE, JR., ACTING PRINCIPAL DEPUTY UNDER SECRETARY FOR RESEARCH AND ENGINEERING

DR. ROBERT R. FOSSUM, DIRECTOR OF DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

ACCOMPANIED BY DAVID C. HARDISON, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (TACTICAL WARFARE PROGRAMS)

HEARING PROCEDURE

Senator **STEVENS**. Good morning.

We will receive the testimony today of Hon. James P. Wade, Acting Principal Deputy Under Secretary of Defense for Research and Engineering and Dr. Robert R. Fossum, Director of Defense Advanced Research Projects Agency.

We are happy to welcome you here today, gentlemen. We will be most interested in your testimony in support of the $21.7 billion requested for research and development for fiscal year 1982. It is an increase of $5.2 billion over the fiscal year 1981.

In the past we have found it necessary to close the hearing for research and development due to classification of the materials to be covered. We are going to attempt to leave the hearing in open session today as long as possible.

At such time that any of the witnesses or members of the subcommittee find it necessary to introduce classified material or ask questions concerning it, it will be necessary to close the hearing. When that time arrives, I will move to close the hearing and, with the support of the subcommittee, those individuals who are not cleared or having the need to know will be required to leave.

Mr. Secretary and Dr. Fossum, again you are very welcome and I would be pleased to have you present your statements in any way you desire. We will place the full detailed statement in the record and we will have questions after each of you have presented your statements.

Dr. WADE. Thank you, Mr. Chairman.

Senator STEVENS. We have reviewed your statement.

BUDGET REQUEST

Dr. WADE. Mr. Chairman and members of the committee, I am pleased to appear before you today in support of the Department of Defense research, development, and acquisition program.

The fiscal year 1982 request for Defense R.D. & A. is approximately $90 billion. This represents a real increase of about 30 percent relative to fiscal year 1981 after considering the effects of the fiscal year 1981 supplemental request.

This increase reflects the real dangers to U.S. interests throughout the world, the deterioration in our defense posture and the need to restore quickly and visibly America's defenses as soon as possible.

The problem we face is how to rapidly make the moves necessary to redress and reverse the adverse trends in the relative balance in equipment and technology between the United States and the Soviet Union.

INVESTMENT CHALLENGE

In this overview I will highlight the challenge which we face and the investment strategy which we intend to pursue to insure that our substantial resource investments are sound. I will also discuss the management of our resources so that we optimize a return on our investment in both the near term and the long term.

Now as to the challenge.

Chapter II of the fiscal year 1982 R.D. & A. report provides a detailed description of the net balance between the Soviet Union and the United States in military equipment and technology.

UNITED STATES/SOVIET INVESTMENT COMPARISONS

Included is a comparison of United States and Soviet military investment, the balance of military equipment that results from that investment to date, and the status of our underlying military technology. To highlight the challenge four major points of concern are noted.

First, the Soviet Union is currently outinvesting us by about a 2-to-1 margin. The cumulative gap in military investment between the United States and the Soviet Union during the past decade now approaches $350 billion in 1982 dollars.

Second, the Soviet Union is outproducing us by more that 2 to 1 in most categories of military equipment.

Third, the Soviet Union is now deploying equipment which increasingly matches the quality of our deployed equipment.

Last, the Soviet Union now has an effort of about twice as great as ours in military research and development creating a growing risk of technological surprise and loss of U.S. technological advantage.

UNITED STATES/SOVIET DEFENSE EFFORT COMPARISONS

Now, to compare levels of defense efforts we assess the complexity and the quantity of Soviet weapons being produced and then estimate what it would cost the United States to produce and sustain a military force having a comparable weapons inventory.

Using this method we conclude that the Soviet military investment measured in constant dollars has continued to grow at a fairly steady rate of about 4 percent per year for the past 10 years. During that same period the U.S. military investment was declining in real terms.

The estimated dollar cost of Soviet military investment exceeded that for U.S. defense programs for the first time in 1970 growing to nearly twice the U.S. investment by 1980. As I had noted earlier, the cumulative disparity in investment from 1971 through 1980 is approximately $350 billion.

The Soviets have used this investment to maintain their numerical force advantages producing military equipment at rates that are typically two or three times that of the United States.

As the United States-Soviet investment disparity has increased, they also have been able to use resources to compete with us in the quality and the sophistication of their equipment, accepting the added penalty of increasing unit costs in order to gain capability. Their investment is also being applied to expand significantly their production facilities.

During the past few years the Soviet military production facilities have been constructed at the highest level of the last two decades, an indication of plans for sustained high production rates and improved productivity during the 1980's.

PRODUCTION

During the past decade the Soviets have produced about three times as many ICBM's and SLBM's as the United States. In the past 5 years they have produced about three times as many tanks and armored vehicles, twice as many tactical aircraft and military helicopters, four times as many attack submarines and roughly the same number of major surface combatants. They are clearly sustaining their production advantage across a wide variety of systems.

Now, when we consider the production contribution of our NATO allies and those of the Soviet Warsaw Pact allies, this production disparity is reduced somewhat. For example, if we compare aggregate NATO to Warsaw Pact production during the past 5 years, the Warsaw Pact has produced roughly twice as many tanks and armored vehicles, about half as many major surface combatants and a roughly equal number of tactical combat aircraft, military helicopters, and attack submarines.

Now, to the extent that this equipment can be produced at comparable levels in the future and used effectively on an alliance basis, the impact of the disparity in production between the United States and the Soviet Union can be reduced significantly.

QUALITY

The Soviets historically have deployed larger quantities of equipment than the United States and we have attempted to offset this numerical advantage by producing equipment of superior quality. But the generation of Soviet equipment now being deployed is incorporating major improvements in quality.

The Soviets are closing the quality gap in a large variety of military systems. They are often fielding one and a half to two generations of equipment while we field one generation so that much of the equipment they have in the field is simply newer than deployed U.S. equipment.

This equipment not only embodies more recent technology but the comparative result is that our inventory is aging at a faster rate than theirs with all the maintenance and readiness problems that this implies.

For example, the average age of U.S. ICBM's is slightly over 10 years while the average age of Soviet ICMB's is less than 3 years. The average age of U.S. tanks that would be employed in central Europe, and we have less than 10,000 in number, is about 8 years. The average age of the first 20,000 Soviet tanks is about 4 years increasing to 8 years if we include the next 20,000 tanks.

While the United States remains superior in the quality of its SSBN/SLBM forces, the Soviets have effecitvely closed the quality gap in ICBM forces. While the United States still leads in the quality of its aircraft and air-to-air missiles, the Soviet Union is closing the gap with the development of fighters, for example the Mig-23, having significantly improved range and payload capabilities and with the development of a look-down/shoot-down missile for their aircraft.

By the early 1980's they will have a tactical air force capable of offensive air operations against NATO. The Soviets are also proceeding with significant new developments in large *Oscar* and *Typhoon* and fast *Alpha* class submarines. But the United States does retain advantages both in submarine quieting and in ASW.

TECHNOLOGY

Now as to technology.

Dollar cost estimates for Soviet military R.D.T. & E. expenditures exceeded annual U.S. expenditures during each of the past 10 years leading to an aggregate gap on the order of about $90 billion.

Their military R.D.T. & E. program is now about twice that of the U.S. program. A clear indication of their commitment to defense technology is the trend toward increasing the share of Soviet military outlays devoted to research and developemnt.

Now, despite the imbalance in R.D.T. & E. outlays we have maintained our leadership in most of the basic technologies critical to our national defense in large measure because of our commercial technology edge and the enormous momentum in defense technology derived from the lead we built up during the 1960's. But we are losing our lead in some key technologies, including electro-optical sensors, guidance and navigation, hydroacoustic technology, optics, and propulsion.

Now, of concern is the Soivet concentration on several unconventional technologies at a level far in excess of the U.S. program. Examples include their high-energy laser program and their charged-particle program. We believe they have made the commitment to develop specific laser weapon systems while our high-energy laser program continues only at the technology base level.

We are also concerned about the momentum of the Soviet research and development program. We can identify about 100 major Soviet systems at this point in various stages of test and evaluation and we expect the Soviets to develop roughly 200 major new and modified systems during the coming decade.

Many of these systems are quite significant, for example, a new SLBM; a new ballistic missile submarine, the world's largest; a new cruise missile submarine, also the world's largest, a new interceptor and associated look-down/shoot-down missile; a new tank; and a variety of precision guided munitions.

The scale of these developments makes it quite clear that the Soviet R. & D. program has had high priority access to funds, to trained personnel, and to scarce materials. Because of the intense and persistent Soviet commitment to defense technology it will be much more difficult to maintain our technological advantage in the future than it has been in the past.

When we consider the secrecy with which the Soviets conduct their activities, it is indeed clear that we will be facing in the 1980's a significantly greater risk of qualitative as well as quantitative deficiencies than ever before.

Now, recognizing this long-term challenge we must also deal with the present by addressing dangerous shortfalls in our strategic forces, our forces for Europe, our capabilities for presence outside Europe, and finally our foundation for an enduring defense.

INVESTMENT STRATEGY

Now to our investment strategy.

The management challenge which faces us is to develop through more efficient means capabilities which meet the demands which we must face. Needed capabilities fall into four categories: the size and structure of our forces; the extent of modernization of those forces; their readiness; and their sustainability.

Our investment strategy focuses largely on the second of these major capabilities. It does in fact encompass a strategy for force modernization. As you know, we must not think about modernization as something that can be taken care of once and for all by simply investing resources across the board.

First, we have to apply our resources efficiently over time. We must view our problem in the long terms, although we must deal with immediate needs. We must keep a coupled balance between these two fundamental interests, that is our near-term needs and the long-term competition.

Next, we must work toward achieving a prudent balance between the force structure, the extent of its modernization, its readiness, and its endurance or its sustainability.

Third, we must be prepared to deter the threat and face it if we must in all of its dimensions. We dare not build massive strength in one mission area, for example, the strategic offensive forces, at the expense of other less visible mission areas. Our modernization must maintain an appropriate balance among all needed missions.

Fourth, we must take advantage of our high technology potential and exploit it where appropriate in dealing with Soviet and other challenges. But we cannot overly rely upon the technology solution at the expense of needed quantitative capabilities in either systems or munitions. Our force modernization must maintain a balance between available high technology solutions and those essential force elements requiring investments in numbers.

Finally, through pragmatic consultation and negotiations we will seek to maintain a better balance between the modernization of our force and those of our allies. Our investment strategy will strive to keep in balance the burden of defense among our partners around the globe and at the same time share the benefits of common research, industrial ventures, and cooperative programs.

RESEARCH, DEVELOPMENT, AND ACQUISITION EMPHASIS

Now the major R.D. & A. emphasis for the 1980's.

The 1980's threaten to be a period of growing international tension and danger for the United States if the Soviet Union continues its military buildup and its aggressive attempts to expand political influence. It will do so unless there are U.S. actions to reduce these dangers.

We must proceed with those actions needed to restore a margin of safety in the short term as well as those actions which, although taking longer to come to fruition, are of such importance that they provide immediate and unambiguous signals of American seriousness of purpose.

Recognizing these dangers, I would like to highlight for you the four objectives of our R.D. & A. program and describe specific thrusts to achieve those objectives.

Senator STEVENS. Could we get to some specifics, Doctor? I don't think we have any disagreement about the threat or about the needs.

Dr. WADE. Yes, sir, I am going to start covering the major points now.

STRATEGIC MODERNIZATION

As to our strategic modernization.

As you know, our strategic systems are designed to deter a nuclear war. The massive buildup in Soviet forces which began in the early 1970's is still underway and, as you know, threatens the survivability of our strategic forces and their ability to deter.

I find it unacceptable to allow the Soviets to realize strategic superiority however defined. For example, we find it unacceptable to watch the Soviet Union mass producing both land-based missiles and a manned bomber fleet while the United States does not have a production line open for either category.

The survivability of our Minuteman ICBM force as currently deployed is threatened by a combination of accuracy and quantity in the number of RV's.

As you know, we are proceeding to develop the MX system and we are proceeding now in the full-scale development of the missile with its first flight test scheduled for 1983.

While we are proceeding with this program, we have announced a thorough review of the various alternatives for basing the future MX system. We will examine basing alternatives considering the military effectiveness, its cost, and its impact on the environment. We expect to complete this review by this summer and then proceed to rapidly develop and deploy this weapon system which is critical to maintaining strategic deterrence.

SUBMARINE SYSTEMS

As to our submarine systems, we are proceeding, as you know, with the production of a longer range Trident I missile system which is also being backfitted into the Poseidon submarines.

We are also continuing the production of the quieter Trident submarine and we have initiated the first design work toward the follow-on Trident II missile.

We are taking several actions to modernize our bomber force. First, we are proceeding with the production of the Air Launched Cruise Missile which will improve significantly our near-term capability to deal with the increasing capability of the Soviet air defense systems. The first ALCM will be deployed on an alert B-52 this year.

Just as important, we are also conducting a vigorous examination of alternatives for a new bomber and plan to complete our selection in June. We are considering the B-1, the B-1 variant, the FB-111 B/C, and an advanced technology bomber incorporating low observables.

Our request for $2.4 billion in fiscal year 1982 will support development of any of these candidates to modernize our aging bomber force.

STRATEGIC FORCES

Just as important, we are taking actions to further improve the enduring and survivable command and control of our strategic forces. The capability for command and control throughout a nuclear war, not just at its inception, is a fundamental underpinning to the foundation of deterrence. Here we are adding about $1½ billion in the area of enduring C^3 to address this question of strategic C^3 and its endurance as part of deterrence.

We are also taking action to develop more credible and timely options associated with an active defense of our strategic land-based deterrent forces. Active defense of MX using ballistic missile defense appears to provide a cost-effective option in the face of substantial increases in the Soviet ICBM threat.

We have developed systems concepts that appear workable and some of the basic technology has been demonstrated. We have requested additional funding to accelerate the evaluation of the technology and more importantly the system issues which remain to be resolved.

The administration remains committed to arms control which is equitable and verifiable. Our experience over the last decade has demonstrated that the Soviets are not going to agree to limit in any significant way the growth of their strategic weapons unless the United States is fully prepared to compete. We are indeed not abandoning our hopes for arms control, but we must maintain realistic expectations.

GENERAL PURPOSE FORCES

As to the modernization of general purpose forces, the increased R.D. & E. which we are asking you to provide will be invested to produce weapons which are needed now and to develop new weapon systems best suited for the future.

For the Army we will be adding weapons, modernizing our air defense systems and proceeding to improve tactical mobility. Relative to the Carter budget we will be adding 151 M-1 tanks, 136 fighting vehicles, 6 advanced attack helicopters, and 200 M-198 towed howitzers.

To enhance mobility we plan to add 18 Blackhawk utility helicopters, modernize an additional 9 CH-47 helicopters, and replace 8,600 1¼-ton vehicles. To improve our air defense we plan to increase procurement of the DIVAD gun, restore the four-battalion Roland program, add a battery of Patriot, and proceed with the Stinger program. To deal with the armor threat we plan to add 120 additional ground laser locator designators and nearly 1,200 night vision sights for TOW and Dragon antitank systems. We will also initiate critical research and development of new technology for laser weapons, aircraft components, and a new light-armored vehicle.

AIRCRAFT PROCUREMENT

In the past the Air Force has also been forced to procure aircraft at low rates that lead to increased unit cost and inadequate modernization. Therefore, we propose to accelerate several of the tactical aircraft production programs.

We plan to increase fighter/attack aircraft procurement from 126 to 222 in fiscal year 1982. F-15 production will be increased from 30 to 42 and F-16 production from 96 to 120. We also propose to add 60 antitank A-10's along with a variety of other tactical Air Force modernization measures, including the procurement of two E-3A AWACS in fiscal year 1982 rather than 1983. To improve our mobility forces we have included funds for eight additional KC-10 aerial tankers and for reengining about half of our KC-135 fleet.

NAVAL TACTICAL AIR

The level of our Navy modernization funding for tactical air has also been inadequate. Included in the 1981 supplemental is funding to increase the F-18 production rate. The fiscal year 1982 program provides increased production for ongoing programs, for example, eight A-6E's, four EA-6B's, five F-18's, six F-14's, three CH-53E's, and six P-3C's.

We are also providing funds for initial production of our aircraft for the Navy and Marine Corps. Our 1982 request also adds funds for several important R. & D. programs such as the new shoulder-launched assault weapons for the Marine Corps, ASW standoff weapons, and torpedo development.

We are proposing substantial additional resources for increased shipbuilding. These additional resources will go toward reactivation of the battleships *New Jersey* and *Iowa* which will be armed with modern weapons, the carrier *Oriskany,* the addition of another CG-47 and an SSN-688, adding sealift, and two additional frigates. We are beginning on the path toward a new aircraft carrier and additional amphibious ships.

INDUSTRIAL BASE PRODUCTIVITY

Now, as to the productivity of the industrial base. As you are aware, the current condition of our defense industrial base can be characterized as not being in good balance. While sufficient capacity generally exists at the prime contractor level to support our defense programs, deficiencies exist at the subcontractor and in particular at the vendor levels. The steady growth of the commercial market when compared with the cyclical nature of defense business, and more recently the post-Vietnam era of decreasing defense procurement, has made defense business unattractive to many suppliers.

Over the past months, as a result of a boom in commercial aircraft production, parts of the aerospace sector have become saturated with orders. Bottlenecks have occurred in many sectors such as our specialized electronics, forgings, and specialty metals.

In addition to the growing demands of the commercial aerospace sector, the supply situation for many of our raw materials and semifinished commodities warrants close attention.

The U.S. dependence on foreign sources is growing. While the United states is from 50 to 100 percent import dependent for 20 key industrial commodities, the Soviet Union is foreign source depending for only 6 of these materials, none exceeding 50 percent.

The U.S. investment in productivity improving technology simply has not kept pace. In the past two decades our productivity gains have lagged behind those of other industrial countries bringing us to a point where much of our industry is less efficient than Japanese, German, French, or Italian industry. Last year Japan produced more automobiles and trucks than we did.

The Department of Defense needs to take a stronger role in encouraging increased imvestment in productivity enhancing equipment by the private industry. Faster depreciation writeoffs can provided an important imcentive. Another would be provided by greater stability in the defense-related marketplace. Multiyear contracting is one way to improve stability.

Long-range resource planning is critical to getting the most out of our limited resources. In the past we have focused on the short term, operating within a 2- to 5-year planning horizon. We are now taking a fresh look at resource planning which would be directed toward setting resource objectives to support our overall modernization strategy while improving efficiency in the acquisition of weapon systems and the development of the supporting science and technology base.

To DOD, manufacturing technology program provides another means to increase the productivity and the responsiveness of the defense industrial base.

Another step to be taken toward solving these problems is action under title III of the Defense Production Act. Title III provides a mechanism for establishing or expanding domestic production capabilities.

INDUSTRIAL BASE NEEDS REVITALIZATION

Now, in summary, the defense industrial base needs revitalization. The Department of Defense will contribute its share via the substantial increase in R.D. & A. funding which we are increasing. We can make further contributions through a combination of improved long-range resource planning, acquisition process adjustments, technology advancements, and capital investment initiatives.

Recognizing this opportunity, the Deputy Secretary of Defense, Mr. Carlucci, has launched a major internal DOD review of the planning, the programing and the budgeting system and the DOD acquisition process. We look forward to working with the Congress and with industry to identify and realize significant improvements which will increase efficiency and improve the long-term productivity of our defense industrial base, providing the foundation for an enduring defense. As important, Mr. Chairman, the Department of Defense has a long history of fostering science and technology that extends beyond narrow efforts related to specific programs. The DOD science and technology program is critical to new military capabilities with spinoffs to our civilian economy.

Our defense research and development policy must continue to stimulate new vistas by sustaining a program of real growth in the science and technology base. This program is essential to sustaining the technological capacity, both military and civil, that has been one of our country's traditional strengths. At the same time, we must prevent the technology we have already developed from being made available to our adversaries.

In summary, Mr. Chairman, the Defense R.D. & A. program involves all three military departments together with our defense agencies. Managing it is a complex endeavor. Working together with the Congress we intend to keep two basic objectives in mind.

The first is to sustain the modernization of our forces so that, one, their capability match the tasks that the Commander in Chief and the American people want us to be prepared to do now and in the longer term. The second is to streamline our acquisition management and our overall resource planning so that our first objective can be achieved at the lowest possible cost to the American people.

Our program as now structured is consistent with these two objectives. With your help I am confident that our real capabilities will be enhanced and will be equal to the challenge of this coming decade.

Thank you, Mr. Chairman.

Senator STEVENS. Thank you.

[The prepared statement of James P. Wade, Jr. follows:]

PREPARED STATEMENT OF HON. JAMES P. WADE, JR.

ACTING UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING
AND
ASSISTANT TO THE SECRETARY OF DEFENSE FOR ATOMIC ENERGY

Mr. Chairman and Members of the Committee:

I am pleased to appear before you today in support of the Department of Defense Research, Development and Acquisition (RD&A) program. The FY 82 request for Defense RD&A is approximately $90 billion. This represents a real increase of about 30% relative to FY 81 after considering the effects of the FY 81 Supplemental Request. This increase reflects the real dangers to US interests throughout the world, the deterioration in our defense posture, and the need to restore quickly and visibly America's defenses as soon as possible.

The problem we face is how to rapidly make the moves necessary to redress and reverse the adverse trends in the relative balance in equipment and technology between the US and the Soviet Union. In this overview I will highlight the challenge which we face and the investment strategy which we intend to pursue to insure that our substantial resource investments are sound. I will also discuss the management of our resources so that we optimize the return on our investment in both the near term and the long term.

A. THE CHALLENGE

Chapter II of the FY 82 RD&A report provides a detailed description of the net balance between the Soviet Union and the United States in military equipment and technology. Included is a comparison of US and Soviet military investment, the balance of military equipment that results from that investment to date, and the status of our underlying military technology. To highlight the challenge, four major points of concern are noted:

- The Soviet Union is currently out-investing us by about a 2:1 margin. The cumulative gap in military investment between the US and the Soviet Union during the past decade now approaches $350 billion (1982 dollars).
- The Soviet Union is outproducing us by more than 2:1 in most categories of military equipment.
- The Soviet Union is now deploying equipment which increasingly matches the quality of our deployed equipment.
- The Soviet Union now has an effort about twice as great as ours in military research and development, creating a growing risk of technological surprise, and loss of US technological advantage.

1. Investment

To compare levels of defense efforts, we assess the complexity and the quantity of Soviet weapons being produced and then estimate what it would cost the United States to produce and sustain a military force having a comparable weapons inventory. Using this method, we conclude that Soviet military investment (procurement, RDT&E, and military construction), measured in constant dollars, has continued to grow at the fairly steady rate of about 4% per year for the past 10 years. During most of that same period, US military investment was declining (in real terms). The estimated dollar cost of Soviet military investment exceeded that for US defense programs for the first time in 1970, growing to nearly twice the US investment by 1980. As I had noted earlier, the cumulative disparity in investment from 1971 through 1980 is approximately $350 billion (measured in terms of constant 1982 dollars).

The Soviets have used this investment to maintain their numerical force advantages, producing military equipment at rates that are typically two or three times that of the US. As the US-Soviet investment disparity has increased, they also have been able to use resources to compete with us in the quality and sophistication of their equipment, accepting the added penalty of increasing unit costs in order to gain capability. Their investment is also being applied to expand significantly their production facilities. During the past few years, Soviet military production facilities have been constructed at the highest level of the last two decades, an indication of plans for sustained high production rates and improved productivity during the 1980s.

2. Production

During the past decade, the Soviets have produced about three times as many ICBMs and SLBMs as the US. In the past five years they have produced about three times as many tanks and armored vehicles, twice as many tactical aircraft and military helicopters, four times as many attack submarines, and roughly the same number of major surface combatants. They are clearly sustaining their production advantage across a wide variety of systems.

When we consider the production contribution of our NATO allies and those of the Soviet Warsaw Pact allies, this production disparity is reduced somewhat. For example, if we compare aggregate NATO production to Warsaw Pact production during the past five years, the Warsaw Pact has produced roughly twice as many tanks and armored vehicles, about half as many major surface combatants, and a roughly equal number of tactical combat aircraft, military helicopters, and attack submarines. To the extent that this equipment can be produced at comparable levels in the future and used effectively on an alliance basis, the impact of the disparity in production between the US and the Soviet Union can be reduced significantly.

3. Quality

The Soviets historically have deployed larger quantities of equipment than the US, and we have attempted to offset this numerical advantage by producing equipment of superior quality. But the generation of Soviet equipment now being deployed is incorporating major improvements in quality. The Soviets are closing the quality gap in a large variety of military systems. They are often fielding 1 1/2 to 2 generations of equipment while we field one generation, so that much of the equipment they have in the field is simply newer than deployed US equipment. This equipment not only embodies more recent technology, but the comparative result is that our inventory is aging at a faster rate than theirs, with all the maintenance and readiness problems that this implies. For example, the average age of US ICBMs is slightly over 10 years, while the average age of Soviet ICBMs is less than three years. The average age of US tanks that would be employed in Central Europe (less than 10,000 in number) is about eight years. The average age of the first 20,000 Soviet tanks is about four years, increasing to eight years if we include the next 20,000 tanks.

While the US remains superior in the quality of its SSBN/SLBM forces, the Soviets have effectively closed the quality gap in ICBM forces. While the US still leads in the quality of its aircraft and air-to-air missiles, the Soviet Union is closing the gap with the development of fighters (e.g., the MIG-23) having significantly improved range and payload capabilities, and with the development of a look-down/shoot-down missile for their aircraft. By the early 1980's they will have a tactical air force capable of offensive air operations against NATO. The Soviets are proceeding with significant new developments in large (OSCAR and TYPHOON) and fast (ALPHA) submarines, but the US retains advantages both in submarine quieting and in ASW.

4. Technology

Dollar cost estimates for Soviet military RDT&E (Research, Development, Test and Evaluation) expenditures have exceeded annual US expenditures during each of the past 10 years, leading to an aggregate gap of about $90 billion (in 1982 $). Their military RDT&E program is now about twice that of the US program. A clear indication of their commitment to defense technology is the trend toward increasing the share of Soviet military outlay devoted to RDT&E.

Despite the imbalance in RDT&E outlays, we have maintained our leadership in most of the basic technologies critical to defense, in large measure because of our commercial technology edge and the enormous momentum in defense technology derived from the lead we built up during the 1960's. But we are losing our lead in some key technologies, including electro-optical sensors, guidance and navigation, hydro-acoustic technology, optics and propulsion.

Of concern is the Soviet concentration on several unconventional technologies at a level far in excess of the US program. Examples include their high energy laser program and their charged particle beam program. We believe they have made the commitment to develop specific laser weapon systems, while our high energy laser program continues only at the technology base level.

We are also concerned about the momentum of the Soviet research and development program. We can identify about 100 major Soviet systems at this point in various stages of test and evaluation and expect the Soviets to develop roughly 200 major new and modified systems in the 80's. Many of these systems are quite significant, for example a new SLBM, a new ballistic missile submarine (the worlds largest), a new cruise missile submarine (also the worlds largest), a new interceptor and associated look-down/shoot-down missile, a new tank, and a variety of precision guided munitions.

The scale of these developments makes it quite clear that the Soviet R&D program has had high priority access to funds, to trained personnel, and to scarce materials. Because of the intense and persistent Soviet commitment to defense technology, it will be much more difficult to maintain our technological advantage in the future than it has been in the past. When we consider the secrecy with which the Soviets conduct their activities, it is clear that we will be facing in the 80's a significantly greater risk of qualitative as well as quantitative deficiency than ever before.

Recognizing this long term challenge, we must also deal with the present by addressing dangerous shortfalls in strategic forces, forces for Europe, capabilities for presence outside Europe, and our foundation for an enduring defense.

B. OUR INVESTMENT STRATEGY

The management challenge which faces us is to develop, through more efficient means, capabilities which match the demands which we must face. Needed capabilities fall into four categories: the size and structure of our forces; the extent of modernization of those forces; their readiness; and their sustainability. Our investment strategy focuses largely on the second of these major capabilities. It does, in fact, encompass a strategy for force modernization. As you know, we must not think about modernization as something that can be taken care of once and for all by simply investing resources across the board. First, we have to apply our resources efficiently over time. We must view our problem in the long term, although we must deal with immediate needs. We must keep a coupled balance between these two fundamental interests--that is our near-term needs, and the long term competition.

Next, we must work toward achieving a prudent balance between the force structure, the extent of its modernization, its readiness, and its endurance--or sustainability. Third, we must be prepared to deter the threat--and face it if we must--in all its dimensions. We dare not build massive strength in one mission area (e.g., the strategic offensive forces) at theexpense of other, less visible mission areas. Our modernization must maintain an appropriate balance among all needed missions. Fourth, we must take advantage of our high technology potential and exploit it where appropriate in dealing with Soviet and other challenges. But we cannot overly rely upon the technology solution at the expense of needed quantitative capabilities--in either systems or munitions. Our force modernization must maintain a balance between available high technology solutions and those essential force elements requiring investment in numbers. And finally, through programmatic consultation and negotiations, we will seek to maintain a better balance between the modernization of our forces and those of our allies. Our investment strategy will strive to keep in balance the burden of defense among our partners around the globe, and at the same time share the benefits of common research, industrial ventures, and cooperative programs.

C. MAJOR RD&A EMPHASIS FOR THE 1980s

The 1980's threaten to be a period of growing international tension and danger for the US if the Soviet Union continues its military build-up and its aggressive attempts to expand political influence. It will do so unless there are US actions to reduce these dangers. We must proceed with those actions needed to restore a margin of safety in the short term, as well as those actions which, although taking longer to come to fruition, are of such importance that they provide immediate and unambiguous signals of American seriousness of purpose. Recognizing these dangers, I would like to highlight four objectives of our RD&A program and describe specific thrusts to achieve those objectives.

1. Strategic Modernization

Our strategic systems are designed to deter a nuclear war. But the massive build-up in Soviet forces, which began in the early 1970s and is still underway, threatens the survivability of our strategic forces and their ability to deter. I find it unacceptable to allow the Soviets to realize strategic superiority, however defined. For example, I find it unacceptable to watch the Soviet Union mass producing both land-based missiles and a manned bomber fleet, while the United States does not have a production line open for either category.

The survivability of our Minuteman ICBM force, as currently deployed, is threatened by the combination of a three-fold increase in quantity and a two-fold improvement in accuracy of Soviet ICBM warheads. We are, therefore, proceeding to develop a modern system, the M-X, and are now well into the full scale development of the missile with its first test flight scheduled for 1983. While we are proceeding with this program, we have announced a thorough review of the various alternatives for basing the future M-X missile system. We will examine basing alternatives, considering military effectiveness, cost, and impact on the environment. We expect to complete this review by this summer, then proceed to rapidly develop and deploy this weapon system which is critical to maintaining strategic deterrence.

Our submarine systems are not faced with a comparable near term problem of survivability. But as a hedge against the development of a future anti-submarine threat, we are proceeding with production of the longer range Trident I missile which is being backfitted into Poseidon submarines. The longer missile range allows the submarine to stand back several thousand miles from the borders of the Soviet Union and still cover all of its targets, thereby increasing the available ocean patrol area of the submarine many-fold. We are also continuing with the production of the quieter Trident submarine, and have commenced initial design work toward a follow-on TRIDENT II missile.

We are taking several actions to modernize our bomber force. First, we are proceeding with the production of the Air Launched Cruise Missile (ALCM) which will improve significantly our near term capability to deal with the increasing capability of Soviet air defense systems. The first ALCM will be deployed on an alert B-52 this year.

Just as important, we are also conducting a vigorous examination of alternatives for a new bomber, and plan to complete our selection in June. We are considering the B-1, B-1 variants, FB-111 B/C, and an advanced technology bomber incorporating low observables. Our request for $2.4 billion in FY 82 will support development of any of these candidates to modernize our aging bomber force.

We are taking actions to further improve the enduring and survivable command and control of our strategic forces. Capability for command and control throughout a nuclear war--not just at its inception--is a fundamental underpinning to the foundation of deterrence.

We are also taking actions to develop more credible and timely options associated with an active defense of our strategic land-based deterrent forces. Active defense of M-X using ballistic missile defense (BMD) appears to provide a cost-effective option in the face of substantial increases in the Soviet ICBM threat. We have developed system concepts that appear workable and some of the basic technology has been demonstrated. We have requested additional funding to accelerate the evaluation of the technological, and--more importantly--the system issues which remain to be resolved.

The Administration remains committed to arms control which is equitable and verifiable. But our experience over the last decade has demonstrated that the Soviets are not going to agree to limit in any significant way the growth of their strategic weapons unless the US is fully prepared to compete. We are not abandoning our hopes for arms control, but we must maintain realistic expectations. Our negotiations must be founded on the need to support the objectives of our security programs as opposed to the assumption that we share common objectives with the Soviet Union. We intend to consult with our allies as we develop our approach, but we also plan to proceed with priority with a substantial program of strategic force modernization.

2. Modernization of General Purpose Forces

The increased RD&A resources which we are asking you to provide will be invested to produce weapons which are needed now, and to develop new weapon systems best suited for the future. Our program recognizes the need to address critical deficiencies now--not in the distant future. It also addresses the need to produce adequate quantities of new weapon systems at efficient rates. Our general purpose force modernization program will begin to correct deficiencies in the quantity and quality of equipment in the hands of our forces.

For the Army, we will be adding weapons, modernizing our air defense systems and proceeding to improve tactical mobility. Relative to the Carter budget, we will be adding 151 M-1 tanks, 136 fighting vehicles, 6 Advanced Attack Helicopters and 200 M-198 towed howitzers. To enhance mobility, we plan to add 18 Blackhawk utility helicopters, modernize an additional 9 CH-47 helicopters and replace 8,600 1 1/4 ton vehicles. To improve our air defense, we plan to increase procurement of the DIVAD gun, restore the four-battalion ROLAND program, add a battery of PATRIOT and proceed with the STINGER program. To deal with the armor threat, we plan to build 120 additional ground laser locator designators and nearly 1,200 night vision sights for TOW and Dragon anti-tank systems. We will also initiate critical research and development of new technology for laser weapons, aircraft components and a new light armored vehicle.

In the past, the Air Force has also been forced to procure aircraft at low rates that lead to increased unit cost and inadequate modernization. Therefore, we propose to accelerate several of the tactical aircraft production programs. We plan to increase fighter/attack aircraft procurement from 126 to 222 in FY 82. F-15 production will be increased from 30 to 42 and F-16 production from 96 to 120. We also propose to add 60 anti-tank A-10s, along with a variety of other tactical Air Force modernization measures, including procurement of two E-3A AWACS in FY 82 rather than FY 83. To improve our mobility forces, we have included funds for 8 additional KC-10 aerial tankers and funds for re-engining about half of our KC-135 fleet.

The level of Navy modernization funding for tactical air has also been inadequate. Included in the FY 81 supplemental is funding to increase the F-18 production rate. The FY 82 program provides increased production for on-going programs (+8 A-6Es, +4 EA-6Bs, +5 F-18s, +6 F-14s, +3 CH-53Es and +6 P-3Cs). We are also providing funds for initial production of other aircraft for the Navy and Marine Corps (+10 SH-60Bs, +12 AV-8Bs, and +12 SH-2Fs). Our FY 82 request also adds funds for several important R&D programs, such as the new shoulder-launched assault weapons for the Marine Corps, ASW standoff weapons and torpedo development.

We are proposing substantial additional resources for increased shipbuilding. These additional resources will go toward reactivation of the battleships NEW JERSEY and IOWA (which will be armed with modern weapons), the carrier ORISKANY, the addition of another CG-47 and a SSN-688, added sealift and two additional frigates. We are beginning on the path toward a new aircraft carrier and additional amphibious ships.

3. Improvement of the Productivity of The Industrial Base

The current condition of our defense industrial base can be characterized as not being in good balance. While sufficient capacity generally exists at the prime contractor level to support Defense programs, deficiencies exist at the subcontractor and vendor levels. The steady growth of the commercial market when compared with the cyclical nature of Defense business--and more recently the post-Vietnam era of decreasing Defense procurement--has made Defense business unattractive to many suppliers. Over the past months, as a result of a boom in commercial aircraft production, parts of the aerospace sector have become saturated with orders. Bottlenecks have occurred in many sectors, such as specialized electronics, forgings, and specialty metals.

In addition to the growing demands of the commercial aerospace sector, the supply situation for many raw materials and semi-finished commodities warrants close attention. The United States' dependence on foreign sources is growing. While the US is from 50 to 100% import dependent for 20 key industrial commodities, the Soviet Union is foreign source dependent for only six of these materials--none exceeding 50%.

US investment in productivity-improving technology simply has not kept pace. In the past two decades, our productivity gains have lagged significantly behind those of other industrialized countries, bringing us to a point where much of our industry is less efficient than Japanese, German, French or Italian industry. Last year Japan produced more automobiles and trucks than we did.

The DoD needs to take a stronger role in encouraging increased investment in productivity enhancing equipment by private industry. Faster depreciation write-offs can provide an important incentive. Another would be provided by greater stability in the defense related market place.

Multi-year contracting is one way to improve stability. For the most part, we contract today on a year-to-year basis. We are convinced that year-to-year contracting is not conducive to the improvements we need, and are therefore initiating a multi-year contracting approach, beginning with a sample set of stable programs identified by the Military Departments for FY 1982 initiation. We expect to build upon this base of multi-year contracting awards in the future.

Long range resource planning is critical to getting the most out of our limited resources. In the past, we have focused on the short term, operating within a two to five year planning horizon. We are taking a fresh look at resource planning which would be directed toward setting resource objectives to support our overall modernization strategy while improving efficiency in the acquisition of weapon systems and the development of the supporting science and technology base.

The DoD Manufacturing Technology Program provides another means to increase the productivity and responsiveness of the Defense industrial base. Numerically controlled machine tools were developed through this program, and the use of these machine tools in the production of DoD systems--as well as in the private sector--has saved billions of dollars in metal removal costs and significantly reduced production leadtimes.

Another step to be taken toward solving these problems is action under Title III of the Defense Production Act (DPA). Title III provides a mechanism for establishing or expanding domestic production capabilities. In the Korean War Period, Title III of the DPA was used to establish $8.4 billion worth of industrial capability with government investment of less than $0.9 billion. There are other material and manufacturing industries vital to the national security which can be stimulated through Title III actions. The machine tool industry would be a prime candidate, but before additional actions are started it is necessary to prove that Title III can again be an effective tool for increasing domestic material capabilities.

In summary, the Defense Industrial base needs revitalization. The Department of Defense will contribute its share via the substantial increase in RD&A funding which we are requesting. We can make further contributions through a combination of improved long range resource planning, acquisition process adjustments, technology advancements, and capital investment initiatives. Recognizing this opportunity, the Deputy Secretary of Defense, Mr. Carlucci, has launched a major internal DoD review of the planning, programming and budgeting system and the DoD acquisition process. We look forward to working with the Congress and with industry to identify and realize significant improvements which will increase efficiency and improve the long term productivity of our defense industrial base.

4. Providing the Foundation for an Enduring Defense

The Department of Defense has a long history of fostering science and technology that extends beyond narrow efforts related to specific programs. The DoD science and technology program is critical to new military capabilities, with spin-offs to the civilian economy. Defense research and development policy must continue to stimulate new technological vistas by sustaining a program of real growth in the science and technology base. This program is essential to sustaining the technological capacity--both military and civil--that has been one of our country's traditional strengths. At the same time, we must prevent the technology we have already developed from being made available to our adversaries.

Summary

The Defense RD&A program involves all three Military Departments and the Defense Agencies. Managing it is a complex endeavor. Working together with the Congress, we intend to keep two basic objectives in mind as we undertake this challenge. The first is to sustain the modernization of our forces so that their capabilities match the tasks that the Commander in Chief and the American people want us to be prepared to do--now and in the longer term. The second is to streamline both our acquisition management and our overall resource planning, so that the first objective can be achieved at the lowest possible cost to the American people.

The FY 82 RD&A program, as it is now structured, is consistent with those two objectives. With your help, I am confident that our real capabilities will be enhanced and will be equal to the challenge of this decade.

STATEMENT OVERVIEW AND SLIDE PRESENTATION

Senator STEVENS. Dr. Fossum, you have a very long statement.

Dr. WADE. We can have questions and answers first, Mr. Chairman, or Dr. Fossum can cover the DARPA program first.

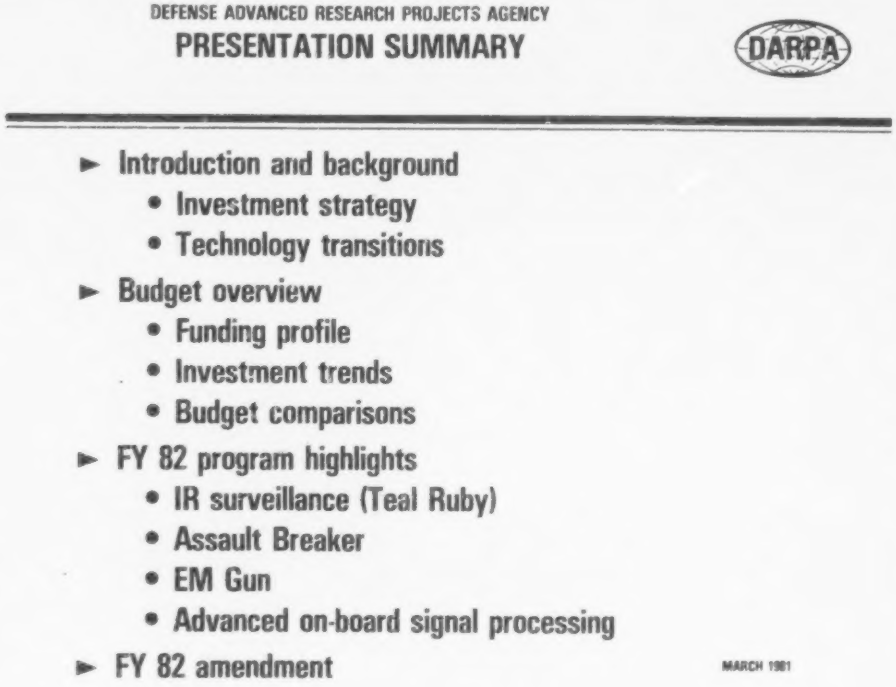
Senator STEVENS. Well, I would like to see if we can get both statements out of the way first before we ask questions because there will be other people coming in later and they will ask the same questions.

Dr. WADE. Yes, sir.

Senator STEVENS. You have a series of charts, doctor. Could we have a summary of your statement and go through the charts?

STATEMENT OF ROBERT R. FOSSUM

Dr. FOSSUM. Mr. Chairman, what I would like to do first is to overview the statement that I would like to submit for the record rather than to go over the statement.



DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

PRESENTATION SUMMARY

DARPA

- ► Introduction and background
  - Investment strategy
  - Technology transitions
- ► Budget overview
  - Funding profile
  - Investment trends
  - Budget comparisons
- ► FY 82 program highlights
  - IR surveillance (Teal Ruby)
  - Assault Breaker
  - EM Gun
  - Advanced on-board signal processing
- ► FY 82 amendment

MARCH 1981

[CHART 1]

DESCRIPTION OF DARPA

In the sequence of charts I have outlined essentially what DARPA is. This is only my second time appearing before this committee. Second, it provides examples of the programs that are listed in the statement. And, finally, it provides some budget overview for this committee.

If I may, sir, I will go through that.

Senator STEVENS. All right, but I will tell you that I am not going to sit here and listen to 65 pages being read to me because I can read them faster than you can read them. We would prefer to have you summarize the statement if you will so we can get to questions concerning this statement.

You provide the statements in advance and we really don't have to have you read them to us, gentlemen. We have read them. And if we haven't, we will read them later because we do do our homework. I do think that our basic problem is to get to the areas where we might have some misunderstanding or some need for clarification.

You proceed the way you want, but I am hopeful that the committee will agree with me that we can accomplish more by trying to eliminate the misunderstandings that members of the committee have concerning the programs or concerning the requests than we can, and I say it respectfully, having you tell us that there is a Russian threat. I know there is a Russian threat. We all know there is a Russian threat.

I hope you will pay attention to the statements being made by the full committee concerning the impact of the defense budget. I don't disagree with it at all. I shouldn't read to you statements either. You can read the statements that come out of the committee.

You proceed. We do want to get down to the point where we can get our teeth into these questions and into these programs and understand the relationship and understand why. I particularly want to go into these two battleships as soon as we can.

Senator STENNIS. Mr. Chairman, if I may say a word. With all deference to you as the chairman, we just don't have any choice. We just have a limited time at the very best. We know about the Russian threat and we have been here for a long, long time. We know those things so let's get down here to this as best we can in line with what the chairman said.

Dr. FOSSUM. I have outlined what I intended to do. If any of this is not worth going through I will be happy to stop. The statement has been submitted for the record. I intend only to go over briefly what was in that statement, including budgets, and to give some examples of programs.

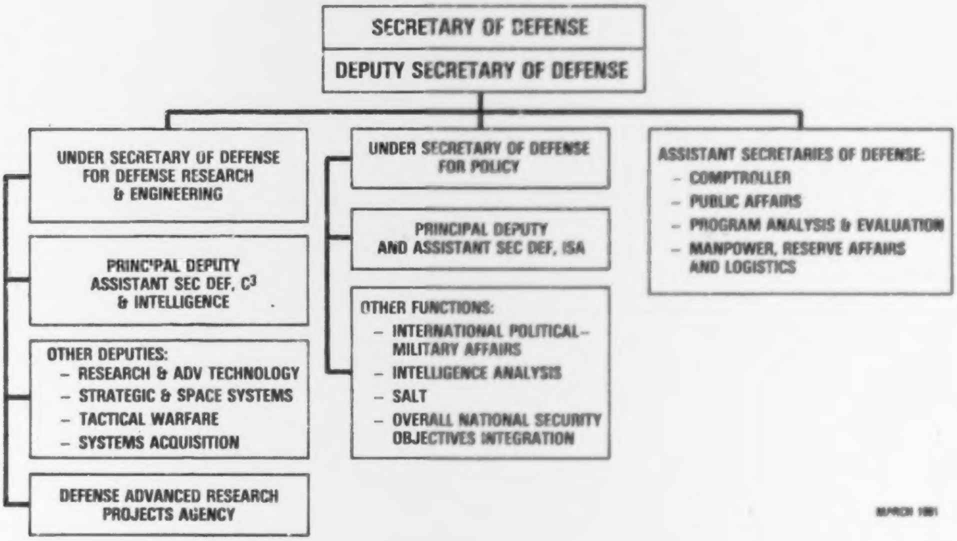
Senator STEVENS. We would like to have you do that but we would like to have you do it with a summarization of what is in the record. We will study the record and our staff studies the record, but we have to get to the details as soon as we can.

Dr. FOSSUM. All right, sir.

Senator STEVENS. I hope that we can set the process of having this committee meet at 8 or at 9:15 where we will listen to a witness or two, ask our questions and be to another committee meeting in two hours. Each one of us has three committees now and we are a very thin group here in terms of the scope that we have got. So we need cooperation. I don't mean to be abrupt, but I do believe we will get more out of this and we will be able to do you more good. We are your advocates when you get to the floor. If you can't convince us then we can't convince the rest of the Senate.

You are prepared this morning, Dr. Fossum, so you tell us what you think we ought to know out of that consistent with the fact that my friend here is liable to leave me sometime and if we don't have him we don't have anybody. He has always been with the Department of Defense. [Laughter.]

Dr. FOSSUM. All right. If I may go on to the next slide then.



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SECRETARY OF DEFENSE

DEPUTY SECRETARY OF DEFENSE

UNDER SECRETARY OF DEFENSE FOR DEFENSE RESEARCH & ENGINEERING

PRINCIPAL DEPUTY ASSISTANT SEC DEF, C^3 & INTELLIGENCE

OTHER DEPUTIES:
- RESEARCH & ADV TECHNOLOGY
- STRATEGIC & SPACE SYSTEMS
- TACTICAL WARFARE
- SYSTEMS ACQUISITION

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

UNDER SECRETARY OF DEFENSE FOR POLICY

PRINCIPAL DEPUTY AND ASSISTANT SEC DEF, ISA

OTHER FUNCTIONS:
- INTERNATIONAL POLITICAL-MILITARY AFFAIRS
- INTELLIGENCE ANALYSIS
- SALT
- OVERALL NATIONAL SECURITY OBJECTIVES INTEGRATION

ASSISTANT SECRETARIES OF DEFENSE:
- COMPTROLLER
- PUBLIC AFFAIRS
- PROGRAM ANALYSIS & EVALUATION
- MANPOWER, RESERVE AFFAIRS AND LOGISTICS

MARCH 1981

[CHART 2]

DARPA REPORTS

This slide simply shows where DARPA reports. It is a unique agency in that part of the tech base that we support reports directly to the Under Secretary for Research and Engineering and is not in the Services as much.

INVESTMENT STRATEGY

DARPA

- ► **DARPA role:**
    - **Long term**
    - **High risk**
    - **High military utility**
    - **Asymmetric technology**
- ► **Guidelines:**
    - **Identify technological fallout**
    - **Stress the technology**
    - **Avoid roles and missions arguments**
    - **Transfer to services**
        - – **Service agents**
        - – **Demonstrations and experiments**

SEPTEMBER 1980

[CHART 3]

INVESTMENT STRATEGY

The investment strategy which is unique also in that the DARPA role is to invest in long-term certainly high risk with high military payoff.

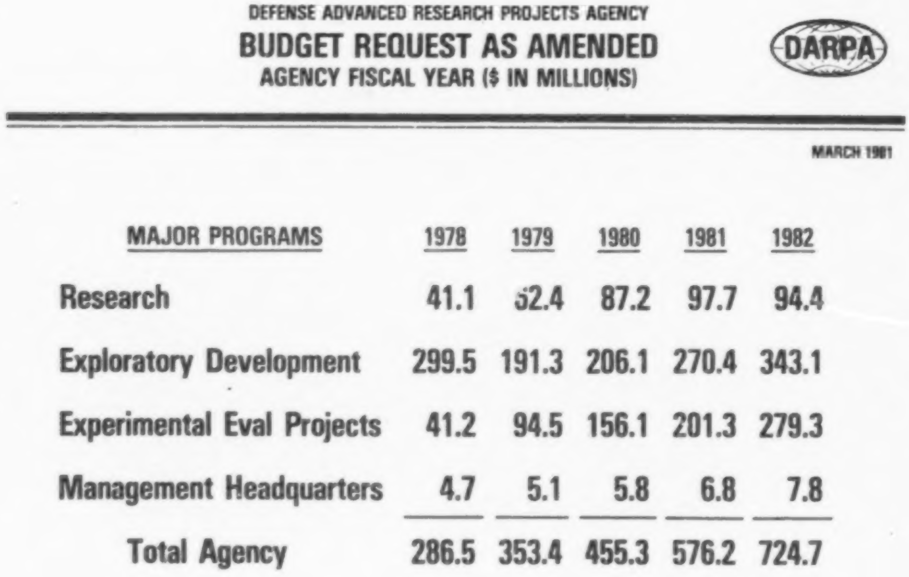
Our purpose in life is simply to reduce the technical risk and to serve as a bridge to transfer research into applications in the military.

The emphasis tends to be asymmetric technology. By asymmetric technology I mean technology which cannot be met in kind by our adversaries within 5 years, for example. By long term I mean that I want to invest the money in long-term, high-pay off projects and not immediate requirements that exist within the services.

The guidelines in any long-term program are to identify the technological fallout and to stress very heavily the technical goals. We can always back off from the goals, but it is very difficult to increase the goals as we go along.

We are fortunate that we are able to avoid any roles and missions arguments as we go along. We do have a substantial program in using the services. We could not do our program without the cooperation of the services. It certainly is part of our transfer.

I would like to then skip that slide and the next slide.



DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

BUDGET REQUEST AS AMENDED

AGENCY FISCAL YEAR ($ IN MILLIONS)

DARPA

MARCH 1981

MAJOR PROGRAMS	1978	1979	1980	1981	1982
Research	41.1	62.4	87.2	97.7	94.4
Exploratory Development	299.5	191.3	206.1	270.4	343.1
Experimental Eval Projects	41.2	94.5	156.1	201.3	279.3
Management Headquarters	4.7	5.1	5.8	6.8	7.8
Total Agency	286.5	353.4	455.3	576.2	724.7

[CHART 4]

BUDGET TRENDS

This then, Mr. Chairman, simply shows our budget. It shows also the trends in the budget in terms of actual then year dollars. It shows that we have grown substantially over a period from 1978 to 1982 in the breakout in the bridging of research to experimental evaluation programs. By experimental evaluation programs I mean essentially demonstrations of the integration of technology not in a weapons system but in a demonstration which could go into a weapons system at some time.

Senator STEVENS. I don't mean to interrupt you, but this is the amount you requested. How much did you spend?

Dr. FOSSUM. These numbers, sir, represent the amount that we spent in 1980, 1979, and 1978.

Senator STEVENS. 1981 and 1982 are request figures?

Dr. FOSSUM. They are request figures.

Senator STEVENS. Give us how much was requested.

Dr. FOSSUM. Our budget is $558 million plus a supplemental request of President Reagan will bring that up to $576 million for this year.

DECREASE IN BASIC RESEARCH

Senator ANDREWS. Can I ask a quick question. Why are you decreasing basic research? My concept of this shop was that it's the place where you were doing the basic research. The far out stuff is trying to get you 5 to 10 years ahead and your cut is in basic research.

Dr. FOSSUM. Mr. Andrews, the major reason for that drop at this time is we have made adequate progress in the particle beam area which is heavy science. That was much more of an accounting type of transfer from 6.1 research into the exploratory development program. So except for the particle beam weapon work, part of that heavy science work was transferred into the exploratory development. Therefore, there is a drop with about $3 million, but in fact the research budget is increasing if you look at the basic small projects which we have.

Senator STEVENS. Give us a comparison chart will you of what you have requested in 1978, 1979, and 1980 and what it looks like you are going to spend in 1981. I think those are apples and oranges. You can just give it for the record.

Dr. FOSSUM. I can give it for the record, but I can generally say the appropriation has been about $10 million on the average below what we requested in each year.

Senator STEVENS. How much did you spend of what you got?

Dr. FOSSUM. We spent it all.

Senator STEVENS. You spent every dime?

Dr. FOSSUM. We spend essentially almost everything. You know, we obligate almost everything that is given. We have, I am sure, less than 4 percent that is not out on contract at the end of the first year of availability.

Senator STEVENS. Well, this is the kind of information we need. Then we don't want any across-the-board cuts in this area of research. If you haven't had any cushion then we need to know that and we need to have figures to show us that there is no give in this.

Dr. FOSSUM. If I may, I would like to answer that for the record.

[The information follows:]

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY (MARCH 1981)

[Dollars in millions]

	Fiscal year—			
	1978	1979	1980	1981
Requested	$280.5	$337.0	$462.0	$572.4
Congressional actions:				
Reductions	−3.0	−15.0	−9.3	−30.4
Increases	+9.0	+31.4	+5.0	+16.2
Appropriated	286.5	353.4	457.7	558.2
Fiscal year 1981 supplemental				+18.0
Total				576.2
Percent obligated at end of 1st year of availability	97.5	96.3	96.6	N/A

EXPLORATORY DEVELOPMENT

Senator STEVENS. Would you tell us how that exploratory development differs from research.

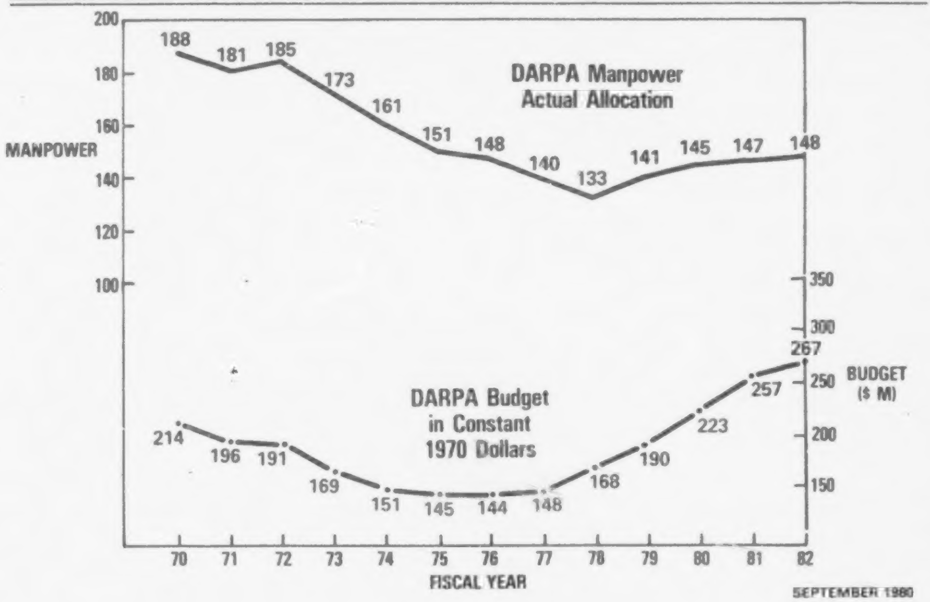
Dr. FOSSUM. The exploratory development is mainly the engineering aspects of a bridge that is taking research ideas and transferring them with engineering into brass board laboratory experiments and transferring science in the research program and ideas in the research program into a more applications oriented application of those particular concepts developed in the research base itself.

Senator STEVENS. Thank you.

Dr. FOSSUM. The experimental evaluation, as I mentioned before, has been the major increase that we have and that has been an attempt to take the results of the exploratory development program and integrate them into platforms which demonstrate to some degree that this technology has useful military applications though it is not to develop the first prototype of a weapons system at this time.

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY DARPA

AGENCY MANPOWER AND FUNDING PROFILE



SEPTEMBER 1980

[CHART 5]

BUDGET IN CONSTANT DOLLARS

In the next slide one of the things that has been of concern to this committee, was the DARPA budget in constant dollars. I have listed that. Essentially we have a real growth of about 24 percent since 1970 or 1971.

Another concern of this committee has been the manpower that this agency will use to manage the programs that we have. We are not growing in manpower substantially and that is one of the advantages of the agency is that it is very small.

I should comment, sir, that we could not handle this size of program without the cooperation of both the technical and the contracting of the services. They are very essential and they are very cooperative in these programs.

BUDGET COMPARISONS

If I may go on then to the budget comparisons. This is not a totally accurate chart. It does not reflect the modified 1982. It does give the idea of the approximate percentages that DARPA is of the overall defense budget. We are rather small but nonetheless we believe we are right on the cutting edge of technology.

I think that if I may I would like to stop the presentation at this point because everything that I would say from now on basically is in the testimony that has been read into the record. In the interests of time perhaps it would be well to break at this point.

[The prepared statement of Robert R. Fossum follows:]

PREPARED STATEMENT OF DR. ROBERT R. FOSSUM, DIRECTOR

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

I. INTRODUCTION

A. DARPA PROGRAM PLANS AND PROGRESS

Mr. Chairman, I am pleased to present to this committee the Defense Advanced Research Projects Agency (DARPA) budget request for FY 1982. During my testimony today, I hope to convey to you the progress we have made in our major technology thrust areas.

As you know, DARPA serves in a "corporate research" role for DoD. It supports research and technology development for potential future defense missions, advanced technology programs that lend themselves to centralized management, and alternative approaches to current Service mission area developments. In accordance with its charter, DARPA invests funds in high-risk technologies that permit rapid exploitation for high military payoff. The Agency's programs are conducted with industrial, university, and not-for-profit organizations in the private sector and with selected Service R&D laboratories. Our programs are executed through the Services to facilitate later transfer of technology to the appropriate Services.

A review of U.S. investment in military technology vis-a-vis the Soviet Union indicates that the Soviets are exceeding the U.S. investment by a dramatic margin. A technological advantage in new weapons is crucial if the United States is to maintain its war fighting capability; ensuring such an advantage is the basis for the current DoD emphasis on detailed investment strategies. This investment process is analogous to industrial practice, which relates alternative markets and products to alternative mission areas and technologies. The FY 1982 DARPA program plans are focused on nine major technology development areas that can result in revolutionary strategic, conventional, and sea-power capabilities. Our nine primary thrusts are in naval warfare; air vehicles and weapons; command, control, and communications; advanced cruise missile technology; land combat; nuclear test verification; space defense; space surveillance; and technology initiatives.

To highlight the current DARPA research and development process and to show the evolution that culminates in an Experimental Evaluation of Major Innovative Technologies (EEMIT) or a capability demonstration program, my statement this year focuses on the EEMIT or demonstration programs and the associated technology base programs for each development thrust. Each of these thrusts is directed to an area of defense concern, and the technology in each will contribute to the U.S. defensive posture in the critical years ahead.

1. Naval Warfare

The DARPA Naval Warfare program seeks new and innovative ways for the surveillance of current and projected Soviet strategic and tactical submarine forces.

In this thrust area, the objectives are to achieve an order-of-magnitude improvement in the performance of passive acoustic sensors and signal processing techniques, to exploit alternative nonacoustic approaches, and to develop multisensor data fusion and display to support tactical targeting decisions. These technologies are being developed and evaluated for proof-of-concept demonstration through large-scale, at-sea experiments. Many of these experiments are conducted jointly with the U.S. Navy in a manner that permits both a continuous transfer of technology and an operational input to the development programs.

2. Air Vehicles and Weapons

The objectives of our major air vehicle technology programs are to demonstrate the critical technologies required for low-cost, long-duration, wide area surveillance vehicles, and to provide U.S. forces with an adequate number of improved range, short takeoff and landing aircraft.

The Forward Swept Wing technology demonstration will continue through the design and testing of critical components such as the large-scale aeroelastically tailored composite wings and the advanced flight control system. A final prototype aircraft design will be completed in FY 1981 and fabrication will continue through FY 1982. A joint DARPA/NASA flight test is scheduled for late FY 1983. It is expected to demonstrate numerous range/payloads, low-speed stability, lighter weight, lower cost and other significant factors in the development and acquisition of high-performance aircraft.

The X-Wing vertical short takeoff and landing (V/STOL) aircraft program represents a major innovation in vertical takeoff and landing design and is a combination of basic advances in composite materials, forward swept wing aerodynamics, advanced flight control techniques, and the convertible turbofan/shaft engine being developed jointly by DARPA and NASA. An innovative alternative to this engine is being pursued based on a forward thrust engine that will, if successful, provide an engine suitable for near-term operational use for approximately five percent of the cost of a new V/STOL engine.

In the air vehicle technology base area, DARPA-sponsored efforts in rapid solidification rate (RSR) technology have resulted in a superalloy that has many orders-of-magnitude increase in high-temperature performance over conventional aluminum alloy fabrication technology. DARPA will pursue the application of RSR to other high-performance alloy materials. These advances are expected to be transferred to appropriate Air Force and Navy RSR technology development programs upon demonstration and validation of the techniques.

3. Command, Control, and Communication (C^3)

DARPA developments in basic computer science research, combined with the application of very large-scale integrated electronics, show great promise for establishing a basis for a wide spectrum of future military systems involved in strategic and theater command and control (C^2). These technology base programs are the foundation for a number of real-environment testbed demonstration programs being conducted jointly with the Services. These testbed programs will provide an excellent and natural means for integrating and evaluating advanced information processing technology into critical C^2 functions. Currently, three major testbed activities are being conducted: the Advanced Command and Control Architectural Testbed (ACCAT) with the Navy, the Fort Bragg Packet Radio Testbed, and a strategic C^3 experiment that is a joint effort with the Defense Communication Agency (DCA) and the Air Force Strategic Air Command (SAC).

The ACCAT facility, located at the Naval Ocean Systems Command (NOSC), provides a realistic C^2 context for demonstrating and evaluating a broad range of information processing technologies using operational Navy databases. ACCAT is also a vehicle that can be used to introduce future capabilities to planners, developers, and potential users of advanced C^2 information processing techniques. Integrated use of geographically distributed computer databases and remote updating of computer software are two of the more promising techniques being developed.

The DARPA/Army Data Distribution System (ADDS) testbed is a jointly operated system located at Fort Bragg and used by an Army Corps to evaluate operational and doctrinal impacts of computer-based information processing in the tactical battlefield. Field use of automated tactical reporting systems, automatic load planning, and resource management concepts and software are being evaluated on an unclassified basis. Modification of the testbed to permit secure information processing will be accomplished during FY 1982 and will include evaluation of classified functions during real-time tactical exercises in the field. This testbed activity is based on DARPA-developed mobile packet radio communication technology and advanced computer internetting techniques that permit a wide variety of packet networks to be interconnected. The original 5-node network has been expanded to 20 nodes, and participation in a major field exercise (Solid Shield) is planned during FY 1981.

An experimental strategic C^3 experiment is being designed that will incorporate advanced technologies such as airborne packet radio, end-to-end network security, and distributed databases for application to reconstruct selected C^2 capabilities during and after a major attack on the United States. ARPANET has been installed at SAC Headquarters and an analysis has been initiated on SAC crisis C^2 information flow. Airborne experiments with existing packet radio equipment have been conducted to validate system operation with aircraft and to simulate SAC airborne and ground mobile C^2 activities.

These testbed activities represent the outgrowth of technology base research in basic computer science and computer communications technology. The purpose of the research is to form a basis for achieving secure, geographically distributed information systems as well as information processing techniques that exhibit a high degree of intelligent function or behavior. For example, a "kernelized" (i.e., software coding security safeguards) computer software system has been implemented, and design of the ADA programming language was completed and accepted as a DoD standard. An ADA-based programming environment for distributed information processing systems will be developed and demonstrated in FY 1982. As it is developed, the results will be transferred to the Services through the various testbed programs. A program to investigate key technology elements of a strategic communication system for data exchange with submarines will continue in FY 1982.

4. Advanced Cruise Missile (CM) Program

DARPA continues to direct its efforts in this area on expanding the technology base for improving the U.S. cruise missile fleet and to provide fundamental, new capabilities for the future fleet. Evolving Soviet developments indicate that technologies must be addressed that will counter the evolving threats. DARPA technology base investment strategies are directed toward achieving longer range and reduced vulnerability. A combination of technologies has been selected to compound the problem of CM detection and acquisition. Efforts continue on the four major elements--autonomous terminal homing, advanced delivery concepts, advanced engine, and CM detection technology.

a. Autonomous Terminal Homing. During prior work, two sensor types, scene-matching algorithms, and a reference map preparation approach were selected. FY 1981 efforts include fabricating the sensor and developing a ground-based Scene-Matching Laboratory. During FY 1982, a sensor flight test and evaluation program will be conducted in which scene-matching algorithms will be evaluated and a single sensor/scene-matching combination will be selected. Pending successful flight testing, these technologies will be transferred to the Air Force for potential implementation in its advanced CM technology programs.

b. Advanced Delivery Concepts. Unconventional designs and launch modes as well as a variety of subsystem technologies are being examined that can provide substantial increases in range payload and improved defense penetration capability. A flight vehicle technology demonstration program will be initiated during FY 1982 to validate these capabilities. Work also will continue on preliminary subsystem designs for a nonnuclear CM.

c. Advanced CM Engine. Development and test of selected engine configurations have been initiated and a concept validation phase will begin in FY 1981.

d. CM Detection Technology. The principal efforts during FY 1981 were devoted to measuring and analyzing propagation phenomena and related environmental factors. More detailed measurements and development of an environmental model will be accomplished during FY 1982. When completed, this program is expected to provide a basic physical understanding of the effects that limit CM detection.

5. Land Combat

Prior technology base investments in infrared detector arrays, missile guidance techniques, and warhead technology provide the basis for two major new demonstration programs to strengthen U.S. conventional forces--Tank Breaker and Assault Breaker. Tank Breaker is a joint DARPA/Army program to develop the technology for a lightweight shoulder-fired fire-and-forget missile to be used in the main battle area. Several candidate Tank Breaker prototype systems have been designed, and component fabrication has been initiated. Based on component testing and preliminary system design, two contractors will be selected during FY 1982 to fabricate and perform controlled flight tests. Transition of the prototypes to the Army for completion of development testing is planned during FY 1983. The Assault Breaker program is a joint DARPA/ Army/Air Force development program to demonstrate component and system technology for a nonnuclear, standoff weapon system capable of engaging and destroying a sizeable force and thus negate a serious Warsaw Pact threat in Central Europe. The integrated system will include missiles, surveillance and guidance radar, and munitions dispensers. In order to demonstrate fully the weapon delivery options of the concept, a joint DARPA/Air Force test of an air-launched version of a standoff missile will be conducted during FY 1982. Successful demonstration of Assault Breaker technology during FY 1982 will provide a basis for engineering development decisions on the weapon guidance radar by the Air Force and on elements of a potential Corps support weapon system by the Army.

Current or proposed investments in land combat technology base developments are directed toward substantial improvements in critical defensive systems.

A hybrid signal processing development program is being conducted to achieve radar signal-to-noise ratios that cannot be achieved with conventional approaches and that can be applied to a wide spectrum of radars. In FY 1982 a full analog/digital signal processor and support system will be developed and tested. Research in CM defense has been initiated to develop a counter to the next generation CM threat.

An outgrowth of the Sanctuary Bistatic Radar program described last year has resulted in initiation of a joint program with the Army to provide responsive and accurate alerting and cueing information to battlefield air defense weapons such as Stinger, SHORADS, and DIVADS. A small, low-cost receiver is being developed to operate with existing radar systems and to provide a substantial improvement in engagement capability and survivability. This program will transition to the Army for incorporation into its SHORADS-C^2 testbed.

A joint DARPA/Navy electronic warfare program has been initiated to provide increased effectiveness for optimizing electronic countermeasures techniques operating against hostile fire control radars. The program applies to a number of air-to-air and ground-to-air uses and has shown considerable promise in preliminary laboratory tests. Field tests of surgical countermeasures techniques are planned for FY 1982.

A significant improvement in cannon artillery is the purpose of a joint DARPA/Army effort. The primary objective for developing a fire-and-forget cannon artillery projectile is to overcome the inherent range and accuracy limitations of artillery. A next generation of artillery, capable of interdicting armor beyond line of sight, may be achieved as a result of a joint DARPA/Army critical technologies demonstration. Advanced infrared terminal homing, projectile propulsion, and projectile guidance techniques will be demonstrated. We are presently in a captive flight test phase of competing concepts, which will be followed by integration of the critical components into a prototype projectile in FY 1982 and live firings in FY 1983.

6. Nuclear Test Verification Technology

A firm technological base has been developed on which U.S. negotiating strategy and technical positions can be established for nuclear test limitation agreements. During FY 1982, this program consists of a marine seismic system (MSS) demonstration and technology base investments for an International Seismic Data Center and basic research to improve the U.S. capability to estimate the yield of foreign underground nuclear tests.

The MSS program will demonstrate the feasibility of installing and operating a state-of-the-art sensor in the deep ocean floor and will be used to determine the potential seismic detection capabilities of such a system. The MSS will substantially enhance our capability to monitor a comprehensive test ban treaty (CTBT) or to validate nonproliferation agreements.

The International Seismic Data Center program supports anticipated CTBT requirements and the need for advanced signal processing techniques that can evaluate regional seismic data. A prototype data center is being planned that will be capable of processing information from national seismic stations as well as a testbed for advanced verification processing procedures. The first operational prototype data center will begin processing data in FY 1982.

The DARPA Yield Estimation Research program supports investigation of basic seismic signal research recorded at long distances to improve U.S. yield estimation of foreign tests. Earth structure phenomenology and behavior of geologic materials are being examined to reduce measurement uncertainties through detailed understanding of the fundamental physical processes involved in seismic propagation.

7. Space Defense Technology

DARPA Space Defense Technology programs are grouped into the two major investment areas in which a considerable payoff in capability is anticipated--high energy laser space defense and particle beam propagation.

Talon Gold, ALPHA, and the Large Optics Demonstration Experiment (LODE) collectively address development of the required technologies for a space-based laser system that can perform a variety of defensive missions.

The Talon Gold program utilizes laser radar techniques developed under its technology base program to achieve the required tracking and precision pointing. Competitive preliminary system designs have begun and will be reviewed. At that time, a single contractor will be selected for the fabrication and evaluation phases. Space experiments will be conducted in a space shuttle sortie.

The program objective of ALPHA is to demonstrate high energy laser device feasibility. Detailed design of laser subsystems will be completed and fabrication will begin. Concurrently, the design of the ground test facility will be initiated. This program will transition to the Air Force upon ground demonstration of laser device feasibility.

The LODE program will establish the feasibility of large aperture beam control for a high energy space laser system. If the LODE program succeeds, it will be due to the considerable achievements of previous technology base programs. For example, the Large Optics Technology series of programs recently completed established the basic feasibility of mirror fabrication techniques; other programs established critical LODE system parameters that include beam control performance and vibration isolation.

Construction of an Advanced Test Accelerator (ATA) will be completed during FY 1982 and will be used to perform critical experiments on the feasibility of propagating intense charged particle beams within the atmosphere. ATA will provide the essential data required by the Services to plan for and design preprototype weapons. Additional efforts during FY 1982 are directed toward subsystem assembly and checkout. Initial beam experiments will be performed during FY 1983.

The current successful pace of laser and particle beam experiments reflects a number of space defense technology base investments that include laser optics technology, acquisition and tracking techniques, and laser device/particle beam component technology.

8. Space Surveillance

The Teal Ruby Experiment and the Advanced Sensor Demonstration are space experiments incorporating first and second generation DARPA infrared detector array technology. The sensors utilize a "staring" concept for high sensitivity, high-resolution detection of low-energy targets against earth background clutter. The Teal Ruby space-based experiment will be launched by space shuttle in FY 1983, and the Advanced Sensor Demonstration is planned for shuttle launch to synchronous orbit during FY 1987.

Technology base activities that enabled confident pursuit of the two space experiments include the High Resolution Calibrated Airborne Measurement program (HI-CAMP), which provided two-dimensional measurements of earth backgrounds and various targets using a prototype two-dimensional "staring" infrared array detector. The HI-CAMP sensor will provide fundamental atmospheric, target, and background measurement data and assess advanced infrared two-dimensional detectors and signal processing techniques. Global year-round background data will be collected in a number of spectral bands during FY 1982 using existing and higher performance infrared sensors. The DARPA Space Based Radar technology development program is directed toward developing the critical component technologies required to permit space fabrication and operation of a large-scale phased array radar. Primary missions include fleet defense and CONUS air defense. Development of very large-scale gallium arsenide integrated circuits is also being pursued; this offers the potential for a substantial increase in radar signal processing speed and/or power advantages that are important for space-based operation as well as for electronic equipment in other environments requiring low power, high radiation-tolerant integrated circuits. A complete technology for ion-implantation has been demonstrated and is being applied to DARPA sensor testbed systems and to Naval Air Systems Command programs.

9. Technology Initiatives

DARPA continues to invest in innovative concepts and ideas that can significantly reduce the cost of weapons and substantially increase defense capabilities. The exploitation of advanced computer-based information processing technology is being pursued to provide automated decisionmaking aids for national and theater-level crisis and battle management. Objectives of the DARPA Teleconferencing Technology program are to develop and demonstrate conference control techniques for a decisionmaking group in which each member is at a different location. Current C^2 system design has not addressed this problem beyond providing a variety of communication and data management equipments. Based on transmission of low bandwidth video, the Teleconferencing Technology program will provide a shared virtual space in which all of the conferees are gathered around a common meeting space. Virtual space technologies are made possible through the development of a unique computer processing procedure that enables the transmission of image sketches. A three-station local area video teleconferencing system is based on the shared virtual space concept and incorporates data sharing, joint document production, and meeting control. A three-station experimental distributed system has also been developed to identify problems associated with a distributed system.

During FY 1982, the design of the local and distributed systems will be modified to include an acoustic management procedure and a high resolution electronic blackboard. Our Distributed Sensor Network program also addresses distributed computer architecture techniques and is investigating a survivable surveillance system based on packet radio technology to link together multiple low-cost distributed sensors. A fully distributed surveillance system offers a non-nodal, highly dispersed system that can be most effective for detecting and tracking low-flying aircraft or for linking a variety of different sensors to provide an overall situation assessment. This effort will result in a computer system architecture for networks of distributed sensors.

These initiatives involve a fundamental examination of the limits of digital computer capabilities to perform intelligent information processing for military functions. Our Machine Intelligence research program is directly concerned with developing innovative methods of converting large amounts of specialized knowledge into a database and to efficiently bring that knowledge to bear on complex and dynamic problems of strategic or tactical situation assessment, planning, and control in the C^2 environment. The objective of this work is to utilize computers to assist or relieve military personnel of decisionmaking tasks that are information intensive, personnel intensive or in environments that present large amounts of information in unexpected situations.

One important product of our concentration on advanced electronics and information processing technology is a joint DARPA/Air Force space signal processing development that is intended to configure an on-board signal processor with a multimission flexibility that is optimized to support military space missions through the year 2000. The processor will process raw sensor data, relieve the communication system, and provide a number of antenna configuration and control functions. Originally developed for the Space Radar program, it became apparent that the design was general enough to encompass all known space signal processing requirements.

These, then, are the nine major DARPA thrusts for FY 1982. In addition to these, technical assistance is being provided to Unified and Specified Commands on potential applications of DARPA technology developments to specific command problems. At the request of the DCINC/EUCOM, we provided technical support for development of a packet-switched network (MINET) that is intended to integrate several U.S. military sites in Europe and to provide interactive access to distributed computers for logistics management. A military message experiment was conducted at PACOM Headquarters to assess the functional utility of automated message handling for the Commander. A state-of-the-art interactive message handling system was developed to create, edit, coordinate, release, and forward messages within the command. DARPA also was requested to examine technological options for improving the combat effectiveness of the Combined Forces Command-Korea (CFC-K). An initial assessment has been completed and suggestions have been made to CFC-K for near-term improvements. As a result of a request from the Air Force SAC, an evaluation was conducted to identify advanced information processing technology alternatives for managing strategic force mission planning and execution. A report was prepared for SAC which included a recommendation to shift to highly proliferated assets with intensive use of computer processing for C^2.

B. CONCLUSION

Mr. Chairman, I have briefly reviewed the highlights of the proposed research and technology program for FY 1982. More detail and summaries of additional programs that emphasize technical progress are presented in the Section II thrust descriptions. The requested FY 1982 budget for this program is $655.0 million. A summary of the proposed application of these funds is provided in Section VI of my prepared statement.

II. THE DARPA BUDGET REQUEST - FISCAL YEAR 1982

A. NAVAL WARFARE

1. EEMIT or Demonstration Programs

DARPA is not currently funding any EEMIT or demonstration programs in this program area.

2. Technology Base (6.1/6.2) Programs

a. Acoustic Research Center (ARC). The ARC is an advanced signal processing testbed that enables acoustic surveillance research, development, test, and evaluation in a real-world environment for eventual implementation into the sound surveillance system (SOSUS) without interfering with basic SOSUS operations. The actual ARC consists of a number of high speed digital computers and peripheral support equipment that are used as research tools to develop advanced signal processing algorithms for incorporation into the SOSUS network. To achieve this capability, wide band, secure, dedicated, digital communications links are provided to the principal Navy laboratories working on the long range surveillance problem.

The ARC testbed concept enables orderly development, testing, and debugging of advanced signal processing techniques to provide a focus for long range upgrading of the SOSUS processing software/hardware set and to provide proven computer software for near term SOSUS updates. This testbed also allows for meaningful demonstration of alternative processing concepts.

Using the coherent inter-array processing (IAP) originally developed and demonstrated at the ARC in FY 1976, the FY 1980 thrust has been to increase the overall efficiency and speed of the signal processing algorithms to perform increased broad area ocean search. In late FY 1980, a real-time search was conducted that systematically covered a 750,000 square mile area. In late FY 1981, new optical processing techniques will be used with the potential to increase the area covered by at least two orders of magnitude, culminating in a potential one-million square mile, real-time search demonstration. In addition to exploring techniques of near-term operational utility, the ARC participates in long time scale data collection to document the changes in ocean acoustic conditions caused by storms, major frontal weather movements, and related natural phenomena. Based on finalization of the ARC system configuration in FY 1981, the facility will formally transition to the Navy in late FY 1982.

b. Nonacoustic Antisubmarine Warfare. The acoustic detection of submarines is well advanced. Because its potential has nearly been met and any additional significant advances can be expected to be expensive and difficult to implement, alternative nonacoustic approaches to submarine detection must be systematically studied. These high-risk, innovative approaches must define and address areas of long range promise and assess the vulnerability of our own units to comparable counterdetection measures.

The Nonacoustic Antisubmarine Warfare program is an all-encompassing research effort to explore the potential of submarine detection based on observed changes in the ocean environment caused by the submarine's presence. As the name implies, the program complements acoustic detection methods and includes techniques that do not depend on active sonar transmissions or passive acoustic emissions from the submarine. Successful nonacoustic detection techniques will require a full understanding of the ambient ocean environment as well as an assessment of submarine-induced observables. An examination of potential observables useful for detection is under way, and two highly promising sensor techniques have been transferred to the Navy.

In FY 1980, all previous related DARPA work was transferred to the Navy for future independent development. DARPA continues to take the lead in developing airborne sensors to detect the submarine hull. A laser hull detection model was developed and efforts are now under way to expand the model to consider other observables. Special survey instruments are being built to allow a scan of ocean optical properties in conjunction with routine hydrographic studies to characterize the background environment. By mid-FY 1982, the technical assessment will be complete and a capability demonstration program will be defined. The DARPA work is directly coordinated with the larger Navy nonacoustic efforts; program results are transitioned directly.

c. Remotely Guided Autonomous Lightweight (REGAL) Torpedo. REGAL is a technology base program to develop, evaluate, and demonstrate the technological feasibility of advanced guidance and acoustic sensor concepts that will significantly improve the target acquisition range of advanced lightweight torpedoes. The REGAL torpedo is an antisubmarine warfare weapon that integrates into a single weapon system an acoustic array and advanced signal processing. Upon water entry, the acoustic array and the torpedo separate, with the array descending to a preset depth while the torpedo conducts a slow speed target search.

Successful development of the REGAL technology base will provide the basis for demonstrating autonomous guidance of the torpedo by means of a communications link to a sensitive acoustic array. This will enable longer detection, acquisition, and track ranges.

An initial REGAL development effort, emphasizing subsystem feasibility and design, produced a prototype that was tested during FY 1980 to evaluate the performance of the guidance and control software. A series of fully autonomous sea runs are being conducted during FY 1981 to evaluate REGAL performance as a function of sensor-target-torpedo geometry, weapon speed and maneuver, target range for handover from stationary to torpedo on-board sensors, and target signal-to-noise ratio. The FY 1982 program will continue to be heavily sea-test oriented, with sea runs becoming progressively more complex as target dynamics are introduced along with the integration of the newly developed brassboard sensor. The final demonstration test series, when completed in FY 1983, will demonstrate the integrated technology base that is necessary for a lightweight torpedo. The REGAL technology base, which is very closely coordinated with ongoing Navy advanced lightweight torpedo and antisubmarine warfare standoff weapon development, will transition to the Navy at the end of FY 1983.

d. Ocean Tactical Targeting (OTT). The OTT program uses advanced processing and communication technology bases to focus on an area of tactical interest and to develop a scene description of sufficient accuracy, resolution, and completeness to support targeting decisions by the local commander. The OTT concept is based on a multisensor data fusion center that combines raw, intermediate, and output level data from broad area ocean surveillance sensors. It generates geographic, parametric sensor cues to obtain further information. An advanced signal processing capability within each broad area sensor responds to cueing and feedback information from the fusion center. Successful technology base development of the OTT concept will result in the ability to accurately locate and identify all platforms in a specified area of tactical interest through the exclusive use of broad area ocean surveillance sensors. This unique approach will maximize the use of existing sensor systems without interfering with their basic missions. At the same time, it will demonstrate a fundamentally new technique of designing future sensors.

Initial research tasks in database management have been completed along with the objectives, schedule, and support (ship, communications, facilities) arrangements for an experiment. This experiment will provide for a limited demonstration of OTT and will stress the collection of data for FY 1982 analysis and evaluation. Subsequent efforts will be on the design and development of prototype fusion center real-time operation and adaptive sensor signal processing, culminating in a major fleet demonstration in FY 1984. The OTT technology base, which is a joint DARPA/NAVELEX program, is planned for transition to the Navy by FY 1985.

B. AIR VEHICLES AND WEAPONS

1. EEMIT or Demonstration Programs

a. Forward Swept Wing (FSW). A manned FSW aircraft made possible with an advanced composite structure and a digital fly-by-wire flight control system will be designed, fabricated, and flight tested to investigate and quantify the aerodynamic characteristics and performance capabilities of this integrated advanced technology vehicle. The program has the potential to achieve major technological breakthroughs in the areas of structures, aerodynamics, stability and control, and configurational design freedom. The flight test will develop confidence in numerous individual technologies, make them viable design options for advanced flight vehicles, and reduce the risk and time associated with their future application.

This program has been structured to demonstrate that advanced composite structures can solve the aeroelastic divergence phenomenon, a static structural instability experienced by forward but not aft swept wings. By solving the divergence problem, a thorough investigation and exploitation of the benefits long attributed to the forward swept wing configuration will be possible, stressing improved maneuverability, low speed and high angle of attack performance, and the considerable design flexibility. Completion of the program through flight test will ensure a credible audit trail from theoretical analysis through design, fabrication, and test, which will enable rapid maturation and acceptance of the pertinent technologies.

Analysis indicates that an FSW tactical aircraft could be as much as 25 to 30 percent lighter than an equivalent aft-swept aircraft or have equivalent range/payload performance improvements. The excellent low-speed stability and control characteristics, higher lift capabilities of the FSW design and enhanced transonic performance available without transonic drag penalties all promise revolutionary capabilities where runway denial is an operational concern or for operation from small ships.

The foundation of the FSW program is based on two decades of composite material research and exploratory development, with special emphasis on the analysis and design techniques developed by the Air Force to aeroelastically tailor wing structures. NASA airfoil design analysis tools were used extensively in the supercritical airfoil designs along with numerical techniques of the inviscid flow model used to determine aircraft structural load distributions. The aerodynamic and structural design techniques developed for the NASA/Air Force high maneuverability aircraft technology (HIMAT) program were also used for FSW analysis. The results of 10 years of Air Force, Navy, NASA, and industry digital flight control design programs are integrated into the proposed FSW flight control system.

Conceptual studies, design analyses, and wind tunnel testing have shown that excellent low-speed handling qualities and short takeoff and landing capabilities, attributed to the configuration for years, are indeed possible. Wind tunnel tests have also documented increased aerodynamic efficiency through improved lift characteristics and reduced drag levels. Large-scale aeroelastically tailored composite wings that were designed, fabricated, and tested have demonstrated conclusively the ability to solve the aerodynamic structural divergence problem. Successful analysis, design, and test of a flight control system with a man-in-the-loop simulation have demonstrated the capability to control the high static instability in the FSW configuration. Final design will be completed and fabrication started during FY 1981, continued through FY 1982, and culminate in a flight test in late FY 1983. A joint DARPA/NASA flight test is planned with further transition of data to the Services following flight test.

b. X-Wing. The X-Wing is a major innovation in vertical takeoff and landing (VTOL) aircraft design which, by stopping the rotor in flight, combines the vertical lift efficiency of a helicopter with the speed, range, and altitude performance of a transonic fixed-wing aircraft. The objective of this effort is to design, fabricate, and flight test a demonstration vehicle of a size representative of an operational aircraft. The unique X-Wing capability is made possible through circulation control, a system by which the lift on each rotor blade can be selectively controlled by varying the momentum flux of air blown through tangential slots along each rotor trailing edge. The X-Wing aircraft uses the circulation control system to produce lift and achieve stability and control of the vehicle during all flight modes, including in-flight stopping/starting of the rotor wing. Design analysis indicates an operational X-Wing vehicle would have approximately three times the range, speed, and altitude performance of a conventional helicopter with equivalent payload lifting capability. Such characteristics would greatly enhance all current VTOL missions and could provide flexible sea-basing and deployment options for the Navy, in addition to providing new capabilities for all the Services.

The X-Wing VTOL initiative was derived from the circulation control rotor work performed earlier by the David Taylor Naval Ship Research and Development Center. It also takes advantage of advanced stopped rotor dynamics and control work done by the Army in the late 1960s. The Navy is using a 49-ft diameter circulation rotor concept in a current flight test program on the UH-2D helicopter to demonstrate improved reliability, maintainability, and active vibration suppression. Also, the wing of an A-6 aircraft was modified by the Navy to demonstrate circulation control for short takeoff and landing performance improvement and completed a very successful flight test program, during which minimum landing speeds were reduced from 120 knots to 75 knots. The X-Wing program will demonstrate the synergistic impact of basic advances achieved in diverse areas such as advanced composite materials, forward swept wing aerodynamics, and advanced digital fly-by-wire control systems. Additionally, a joint DARPA/NASA convertible turbofan/shaft engine program is being conducted in parallel to demonstrate a new and more efficient propulsion system for the X-Wing program or other vertical/short takeoff and landing aircraft concepts.

Significant technical successes, recognized program maturity, and broad potential operational applications resulted in rapid evolution of the X-Wing program during the third quarter of FY 1980 to permit a flight assessment of the concept with operational similitude. In response to a restructuring directive, initial competitive efforts were under way by the beginning of FY 1981 that emphasized multi-Service application studies, detailed design of a large scale rotor and control system, preliminary design of an operational-size flight demonstrator vehicle, and preparation of a detailed program development plan. A low-cost modification of the TF-34 engine is being pursued in a related program. This modification would enable the TF-34 engine to produce forward thrust and shaft power for the X-Wing vehicle; its successful completion could provide a developed, operational engine for approximately 5 percent of the cost of a new VTOL engine. It is anticipated that the program will transition to the Navy at the end of FY 1983.

2. Technology Base (6.1/6.2) Programs

a. Rapid Solidification Technology. Rapid solidification technology applies to alloy systems that are cooled very rapidly from the molten state to a solid at rates ranging from one thousand to one million deg per sec. Methods for achieving these high solidification rates include atomizing the liquid to fine droplets that produce alloy powder; impinging a stream of molten alloy against a rotating, cooled cylinder, which produces solid alloy ribbon or flake; and melting a thin surface layer by means of a laser or an electron beam, which rapidly solidifies onto the underlying solid. Such techniques have been applied to aluminum alloys, high-temperature nickel-base superalloys, and high-strength steels.

The principal benefit of rapid solidification is the enormous improvement in alloy chemical homogeneity. When compared with conventional ingot processing methods for nickel-base superalloys, this homogeneity yields alloys with an increased temperature capacity of 200°F. Other positive effects include very strong aluminum alloys that have the properties of titanium, load-bearing steels capable of carrying tremendous loads, and exciting alloys for batteries, magnets, and catalysts.

DARPA-sponsored efforts in rapid solidification technology have resulted in a superalloy that contains no chromium or cobalt and has over a 20-times increase in high-temperature creep resistance, aluminum alloys that have demonstrated a 30-percent increase in specific stiffness and a 100-times improvement in life under cyclic stress, and stainless steels that contain alumimun instead of chromium. DARPA expects to soon demonstrate a scale-up of high specific stiffness aluminum alloys and expand exploration of new rapid solidification techniques as applied to other high-performance alloy systems. The Services, particularly the Air Force and the Navy, have ongoing programs in rapid solidification technology, and it is expected that several DARPA technology developments will be transferred to Service advanced technology demonstration efforts.

C. COMMAND, CONTROL AND COMMUNICATIONS (C^3)

1. EEMIT or Demonstration Programs

a. Advanced Command and Control Architectural Testbed (ACCAT). The ACCAT is a testbed at the Naval Ocean Systems Command (NOSC) that was established to explore the applicability of advanced information processing technology to operational Navy systems. Remote sites at the Naval Postgraduate School, Commander in Chief Pacific Fleet, and Fleet Numerical Oceanographic Center are linked to the central site at NOSC over a secure subnet of the ARPANET. A shipboard mobile access terminal will provide secure access to shore-based databases via a Navy communications satellite link to the ARPANET.

ACCAT provides a realistic command and control context for demonstrating and evaluating a broad range of information processing technologies including natural language access to geographically distributed databases, remote maintenance of software, and device-independent graphic systems. Naval users are able to evaluate these technologies using operational Navy databases. A naval warfare environment simulator provides an interactive environment for conducting realistic command and control exercises from the remote sites. The ACCAT will introduce planners, developers, and potential users of future command and control systems to state-of-the-art information processing capabilities.

ACCAT utilizes packet switching network technology, including end-to-end security on the ARPANET, a high bandwidth local command center network, and internet technology to link the Navy communications satellite to the ARPANET. Development of the natural language access to databases and the ability to reliably support databases located at geographically separated sites resulted from research in intelligent systems and advanced network concepts.

A distributed database management system has been developed and demonstrated. It will be demonstrated further in FY 1982 using existing operational Navy databases. A naval warfare environment simulator has been developed and is in daily use from the ACCAT central and remote sites. A breadboard mobile access terminal has been developed and will be tested in FY 1982 between a deployed ship and a shore-based command center. A device-independent network graphics system is being integrated with the distributed database management system, and a graphics editor is being developed to permit geographically separated command and control users to prepare and present situation and status information graphically. The ACCAT will be transferred to Navy management at the end of FY 1982.

b. Fort Bragg Packet Radio Testbed. Based on a Memorandum of Understanding among DARPA, U.S. Army Training and Doctrine Command, Development and Readiness Command, and the XVIII Airborne Corps, the DARPA/Army data distribution system (ADDS) testbed is a jointly operated system used by the Corps to evaluate experimentally the operational and doctrinal impact of the use of information processing in the tactical battlefield. A packet radio computer communication network at Fort Bragg, North Carolina, is connected through gateways to the ARPANET and provides the Corps with access to selected computing resources to support experimental field and garrison operations. Numerous application software packages have been developed to support field use of automated tactical reporting systems, automatic airborne load planning, record keeping, and resource management.

Computer-based battlefield information systems are expected to place demands on communication technology that the Army has not heretofore explored. This testbed effort forms the basis for Army-designed experiments in field use of computer resources to support command, control, and logistics functions. The plan calls for securing the system in FY 1982 to allow the technology to be employed in classified field exercises, which will provide feedback to the Army on operational and doctrinal impacts and information to DARPA on system performance.

The packet radio testbed is intended to provide the potential tactical users of battlefield information processing systems with early access to the technology to assess its utility and to formulate ideas for new applications in distributed automated data processing. The early exposure and feedback will also serve to guide DARPA research and development initiatives toward areas deemed the most promising by future users.

This testbed effort is based on the DARPA-developed mobile packet radio communication system and the internetting technology that allows a wide variety of packet networks to be interconnected to support computer communication across and among systems connected to any of the constituent networks. Proven application software--such as message and database management systems--as well as experimental applications such as automated airborne load planning, tactical status reporting, and fire control form the core of the user utilities supported by the combined packet radio and ARPANET system.

The 5-node, initial packet radio network at Fort Bragg has been expanded to 20 nodes. An automated, airborne load planning system has been implemented, is in regular use, and is being expanded to support additional aircraft types. Two field demonstrations have been successfully carried out and a major field exercise (Solid Shield) is planned in 1981. Early in FY 1982, packet radios will be used to support experiments with automated fire control at Fort Sill, Oklahoma; later that year, the packet radio network will be secured to support classified field exercises at Fort Bragg. The testbed system will be made available to the Army at the completion of the joint DARPA/Army technology assessment effort (approximately FY 1983).

c. Strategic C^3. The strategic C^3 experiment is a cooperative project of DARPA, the Defense Communications Agency (DCA), and the Strategic Air Command (SAC) to demonstrate the feasibility of using advanced technologies to support survivable trans- and post-attack command and control. An experimental system is being created by which advanced technologies such as airborne packet radio, end-to-end network security, and distributed knowledge and data bases may be evaluated and applied to reconstruction of selected command and control capabilities during and after a major attack on this country. The program specifically focuses on the reconstitution of surviving communications and strategic forces following a nuclear attack in the context of the broader national command and control mission.

Staff of the SAC are being introduced to computer communication reconstruction concepts through the installation of ARPANET facilities in the headquarters, numbered air forces, and Air Defense Command. The communication range of packet radio network technology is being extended for airborne use and will provide automated services to airborne assets, such as the airborne command post. Concepts will be developed to facilitate automated support of distributed command and control. The experiment will provide flexible and survivable automated support to the SAC staff so that doctrine for employing such facilities for crisis management can be established and tested in concert with technological development.

The concept of automated support for distributed command and control in an airborne environment is made possible by the existing packet radio technology. End-to-end security techniques are being developed to provide full security for the system. Distributed and replicated data base management techniques currently under development will be tailored to this application.

ARPANET access has been provided at SAC headquarters and selected staff are gaining familiarity with it. An analysis of SAC crisis command and control information flow is under way. Airborne experiments with existing low-power packet radios have been conducted at short range to validate the system's operation with aircraft and to simulate SAC airborne and ground mobile command and control activities. Airborne testing will continue in FY 1982 with military aircraft, and a high-power packet radio amplifier will be completed to extend its range to several hundred miles. The distributed database management system developed for ACCAT will be utilized to replicate databases for data survivability. This program will be transitioned to the Air Force in FY 1985.

2. Technology Base (6.1/6.2) Programs

a. Basic Computer Science. Basic computer science research is developing fundamental new information processing technology that will form the basis for future military systems. This includes research in certifiably secure operating systems to support multilevel security applications, distributed processing for increased survivability, and system development environments based on the high-level language ADA developed by DARPA. Efforts are also directed at applying machine intelligence concepts to make information systems easier to use and at developing architectural alternatives for C^3 applications, including distributed message systems, which are at the core of military communication requirements.

The results of this research will form the technological basis for building secure, geographically distributed information systems as well as systems that can exhibit a high degree of intelligent behavior. A hierarchical file system has been designed that provides automated migration of files between local storage and a centralized file system and, by FY 1982, implementation of this system will be completed. A kernelized secure operating system has been implemented, and the design of a secure distributed message system will be completed in FY 1982. The design of the ADA programming language was completed and accepted as a DoD standard. An ADA-based programming environment for distributed systems will be developed and demonstrated in FY 1982. Research results from this program will be transferred to the Services through the various testbed programs.

b. Computer Communications Technology. The packet communication technology program is exploring computer-based methods for controlling, allocating, and accessing a variety of information transmission media (e.g., mobile radio, broadcast satellites, coaxial and optical cable, leased telephone circuits). Collections of networks are interconnected to each other by means of small gateway computers. End-to-end security is being developed for these packet-switched networks, and applications such as multimedia message systems and real-time packet-switched voice are being developed for a multinetwork environment.

Packet technology forms a sound basis for supporting integrated voice and data communications in a multiple network environment. It is the only technology that can achieve both highly dynamic demand allocation of transmission resources and efficient utilization of communication capacity while concurrently supporting real-time information exchange among people, among computers, and between people and computers.

Packet radio network control software is being implemented to permit highly survivable operation of a large number of packet radios; in FY 1982, a low-cost version of the packet radio will be developed. A remotely keyed end-to-end internet security system has been demonstrated and, by FY 1982, it will be certified for use at the Fort Bragg testbed. A new concept for robust satellite networking has been developed based on a large number of low-cost satellites capable of communicating with each other as well as with the ground. A narrow-band packet voice terminal has been developed; starting in FY 1981, it will be used for multi-user voice communications over a wideband (3 Mbps) satellite channel. Internet experiments will be conducted in FY 1981 and FY 1982 including electronic message forwarding, multimedia conferencing, and ARPANET connection to commercial packet-switched networks. Most of the technology developed in this program will be transferred to DCA and the Services through joint technology or testbed programs, but some will be transferred by means of the DoD protocol standardization effort for which DCA acts as the executive agent.

c. Strategic Laser Communications. The Strategic Laser Communications program is a joint DARPA/Navy effort to develop the technology necessary to provide essential communications support to submerged strategic missile submarines (SSBNs) without compromising their natural immunity to detection. This communication capability could be provided by blue-green laser pulses from satellites capable of penetrating clouds and water to reach the SSBNs. The laser pulses could be provided directly from a satellite-based laser, which would be constrained to very low power by current space power systems and limited laser efficiencies, or from a higher power, ground-based laser reflected from a low technology space-based relay mirror. The program is investigating key technology elements to determine the best candidate for an early end-to-end communication demonstration.

A fully deployed system would provide three payoffs essential to the maintenance of our strategic forces: (1) continued invulnerability of our SSBNs through decreased detection opportunities; (2) increased robustness of the strategic C^3 system itself, possibly providing continuing command and control into the trans- and post-attack periods; and (3) a wide range of tactical applications.

The Strategic Laser Communications program draws on an unusually broad technology base for its implementation. Blue-green laser device technology has focused on excimer and solid state lasers developed over the years by DARPA, DOE, and the Services. Other technology elements include adaptive optics for atmospheric turbulence compensation; wide field of view, narrow-band optical receivers; and construction of comprehensive communication link models that utilize the optical oceanographic and meteorological databases developed over the years. Major accomplishments include the demonstration of laser pulse propagation through clouds and the development of an adequate, if limited, optical receiver for initial communication experiments in FY 1981. In these communications experiments, a blue-green laser beam will be transmitted from an aircraft through clouds and water to a submerged submarine. An improved optical receiver will be built for the space-based approach and for the ground-based approach. Atmospheric compensation will be demonstrated in the laboratory in FY 1981 and in the field in FY 1982. The program will transfer to the Navy, in accordance with a Memorandum of Agreement, at the conclusion of the first full-scale end-to-end verification experiment.

D. ADVANCED CRUISE MISSILE PROGRAM

1. EEMIT or Demonstration Programs

DARPA is not currently funding any EEMIT or demonstration programs in this program area.

2. Technology Base (6.1/6.2) Programs

a. Autonomous Terminal Homing (ATH). The ATH program is developing and demonstrating critical technologies for an advanced, day-night and adverse weather, precision terminal guidance system for low-altitude cruise missiles. The guidance system uses an onboard infrared sensor to obtain images of the target area, which are then compared by means of advanced scene matching algorithms with prestored reference images that are generated in a highly automated reference preparation facility prior to launch. Also being pursued for the ATH sensors is a terrain-following/obstacle avoidance information capability that can significantly reduce cruise missile flight altitudes and, thereby, improve penetration survivability.

The technologies being developed are directly applicable to current and next generation cruise missiles. The resulting advanced guidance system will provide our cruise missiles with the required flexibility, accuracy, and penetration survivability necessary in the mid-to-late 1980s.

During FY 1980, two sensor types, two scene matching algorithms, the reference preparation approach, and the associated integration contractor were selected based on previous sensor/scene matcher performance evaluations. Major efforts during FY 1981 include the fabrication of the imaging sensors, planning for the sensor flight test program, and development of a ground-based Scene Matching Laboratory. During FY 1981, the scene matching contractors will also complete the initial phase of their development effort. Reference preparation activities will include final development of automated processing techniques and the completion of an integrated reference preparation facility. Using data collected during the FY 1982 sensor flight program, the two competing scene matching algorithms will be evaluated in the Scene Matching Laboratory and a single sensor/scene matcher combination will be selected for continued development. This technology will be transferred to the Air Force Wright Avionics Laboratory for use in the advanced technology cruise missile.

b. Advanced Delivery Concepts. The Advanced Delivery Concepts program is investigating unconventional designs and launch modes as well as a variety of synergistic subsystem technologies to provide both substantial increases in range-payload and improved penetration capability for the strategic delivery vehicle. This program considers long range and low observables at low altitude to be essential features for the next strategic cruise missile. Advanced delivery vehicle design considerations include provisions for forward looking sensors, threat warning sensors, and onboard flight path optimization systems. The Advanced Delivery Concept project will provide a next generation cruise missile to counter evolving threats to the present cruise missile.

In FY 1980, the program investigated techniques to greatly increase range and to develop a cruise missile optimal flight path system, developed techniques for cruise missile cost reduction and an employment concept for a nonnuclear cruise missile, and formulated requirements for a dispenser and penetrator munition. Under associated activities, the development of the cruise missile optimal flight path system is continuing with refinement of the algorithm and integration studies. The airframe contractors began integration studies for the autonomous terminal homing system and a terrain-following/obstacle avoidance system. Work will continue on the nonnuclear cruise missile with conceptual designs for dispenser and penetrator munitions. Efforts in terrain-following/obstacle avoidance will also continue, together with bomb damage assessment system development.

The program will initiate the transfer of technology to the Air Force in late FY 1981/early FY 1982 through a vehicle technology demonstration program that will carry one contractor for an approximate 3-year flight demonstration phase.

c. Advanced Cruise Missile Engine. The Advanced Cruise Missile Engine program is developing a high payoff engine concept with a potential to utilize new high energy fuels, increased thrust, and a reduction in fuel consumption. Currently under investigation is a compound cycle turbofan engine (CCTE) that replaces the combustor of a typical turbofan with a two-stroke, high-speed (8000 rpm) diesel engine. This project is also investigating an excentric engine, consisting of a three-spool turbofan with the third spool (or high pressure compressor, combustor, and turbine) mounted off-axis to the other two spools.

The advanced cruise missile engine will enable the development of smaller vehicles (more per cruise missile carrier) as well as allow more payload-range combinations for advanced cruise missile options. The increased payload will put larger nuclear warheads or conventional munitions on the target, and the increased range will provide both more flexible target routing and increased cruise missile carrier survivability by permitting the cruise missile to be launched further away from enemy perimeter defenses.

The development and testing of the CCTE single cylinder test rig is nearing completion. The CCTE will demonstrate forecasted engine speed, pressurization, and temperature. The design of the excentric engine third spool has been completed and fabrication has begun. Testing of the third spool at full operating pressure and temperature (2500°F) for one hour will take place with Columbium turbine blades in early FY 1981. The engine demonstration (validation phase), a 3-year effort to be initiated in FY 1981, will continue with the design and fabrication of the full integrated engine. Completion of the demonstration/

validation is scheduled for mid-FY 1984 with a demonstrated thrust specific fuel consumption reduction from that of the current cruise missile turbofan engine.

d. Cruise Missile Detection Technology (CMDT). The DARPA CMDT program is designed to develop a strong base of understanding of the phenomena that determine the capability limits of those defensive systems used to counter cruise missiles. Radar masking, clutter, and propagation data, as well as infrared background data, are being collected and analyzed in order to establish such a base. The validated phenomenological data will be used to modify and refine models of defensive systems' performance so that the survivability rate of cruise missiles can be confidently predicted.

This program is providing the basic physical understanding of the effects that determine the limits of defensive systems. These results are being provided to the current and advanced cruise missile research, development, test and engineering community so that it can maximize U.S. cruise missile survivability against current and reactive defense systems.

The principal efforts in FY 1980 concentrated on measurements and analysis of both ground-based and airborne radar clutter and analysis and measurements of propagation phenomena. Studies of actual terrain masking and ground clutter, as well as predicted masking and clutter at specific sites, and analysis and measurements of infrared clutter background were also performed. An all-wheel-drive truck with an X-band radar and digital recording system measured and recorded clutter data at over 70 sites as a precursor to a more elaborate, five-frequency set of equipment that will visit these sites in early FY 1981. In FY 1982, the second phase of radar clutter and propagation measurements will be continued and infrared background measurements will be completed. Analysis, modeling, and measurements of the airborne look-down clutter will also be completed.

Although there is no plan to transfer this entire program to the Services, the results of the analyses, studies, modeling, and measurements have been and will continue to be provided to the Services and to those agencies and industries involved in U.S. cruise missile RDT&E.

E. LAND COMBAT

1. EEMIT or Demonstration Programs

a. Tank Breaker. The purpose of this program is to develop the technology for and demonstrate the feasibility of a next generation medium antiarmor/assault precision guided weapon system that is single manportable, shoulder fired, fire-and-forget, and capable of achieving high lethality against advanced armored combat vehicles and other targets in both open and urban terrain. NATO requires medium manportable antitank systems capable of defeating the Warsaw Pact armored threat. The objective of the Tank Breaker program is to eliminate the deficiencies inherent in currently fielded medium antiarmor weapon systems, command guided or laser beamrider weapon systems, and unguided antiarmor weapon systems by demonstrating an advanced manportable, shoulder fired, antitank/assault weapon system to defeat advanced armored targets.

The Tank Breaker program was derived from advanced imaging infrared focal plane array (IIR/FPA) technology developed under the DARPA Advanced Imaging Infrared program. The Tank Breaker program was initiated in April 1980 after concept definition studies and the results of captive flight tests of seekers developed under the Advanced Imaging Infrared Seeker program indicated the potential for an advanced manportable antiarmor/assault weapon system that would integrate emerging technologies for high density IIR/FPAs, advanced signal processing, missile guidance and control, reduced impulse launch mechanisms, progressive burning rocket motors, and advanced warheads in a low-cost, high-performance, day/night, fire-and-forget missile that would be a replacement candidate for the Dragon medium and antiarmor weapon system. Under Phase II of the program, four contractors began developing critical components of competing system concepts for IIR/FPA seekers, missile launch, and guidance and control. This phase continued into the second quarter of FY 1981 with comparative flight test and evaluation of lock-on-before-launch, fire-and-forget seekers, missile launch, and flight control systems by the four contractors. Based on comparative test results and proposals for Phase III full-scale system demonstration, two contractors will be selected to develop and demonstrate their designs for the Tank Breaker missile. Advanced Phase II seekers will undergo a captive flight test, and eight controlled flight test vehicles also will be flight tested. Twelve advanced development Phase II Tank Breaker missiles, six from each contractor, will be tested in competition with the Army's candidates for the Infantry Medium Antiarmor/Assault Weapon System (IMAAWS). The program will transition to the Army when the winner of the competition enters engineering development.

b. Assault Breaker. The Assault Breaker program is developing and demonstrating technologies for standoff acquisition and destruction of armored formations beyond the forward edge of the battle area. The system includes Assault Breaker ground- and air-launched missiles and the associated Pave Mover radar. The long range airborne radar provides standoff surveillance to find and track targets and guidance for standoff missile attack or for penetrating aircraft direct attack of the targets. The missiles and their munition dispensers provide the capability for delivering terminally guided submissiles and submunitions to a high degree of accuracy and achieving a high kill probability.

From 1978 through the first quarter of FY 1980, initial component technologies were developed and demonstrated for the Pave Mover radar, T-16 Patriot ground-launched missile and munitions dispensers, and terminally guided submissiles and submunitions. In FY 1979 and 1980, tests of the munition dispensers at supersonic and high subsonic speeds proved the feasibility of stable, dispensing munitions in the flight regime of the free flight missile. In FY 1979, captive flight and tower tests demonstrated the capability of the submunitions to acquire, home, and impact on targets; in FY 1980 free-fall flight tests of the infrared terminally guided submissiles were conducted by two competing contractors. Those free-fall flight tests using millimeter wave radar seekers were not successful, and that effort was terminated in late FY 1980. A second smart bomblet submunition for use against soft targets was successfully tested in February 1980 and selected for the flight demonstration. Roof House tests of the Pave Mover radar in FY 1979 proved that the goals could be met for target surveillance, target tracking, and weapon guidance. Development of two competing radars continued.

The ground-launched version of the Assault Breaker weapon system concept is being demonstrated at White Sands Missile Range. The two competing Pave Mover radars have been integrated in F-111 aircraft and are undergoing surveillance and target tracking tests that will qualify Pave Mover for tests with the Assault Breaker missile. Both the infrared terminally guided submissile and the smart bomblet submunition are completing full-function qualification tests at White Sands and Sandia Laboratories, New Mexico, to qualify them for the flight test program. The ground-launched Assault Breaker demonstration at White Sands is being conducted as a comparative evaluation of the T-16 Patriot and T-22 Lance II ground-launched missiles. Six missiles of each type are being fired in this phase of the program. The first two are being fired with inertial guidance to verify basic missile accuracy, demonstrate the capability of their dispensers to distribute dummy submunitions, and measure ballistic accuracy. The second two firings will evaluate the ability of the missiles to dispense live submunitions and the ability of the submunitions to achieve a "kill" on stationary tank targets. The Pave Mover radar capability for tracking targets and the in-flight missile are also being evaluated. In the final two shots, the entire system will be evaluated against moving targets: the radar's ability to acquire and track a moving target and provide guidance to the missile; the missile's ability to guide accurately to the moving target and dispense its load of submunitions; and the submunition's ability to achieve multiple "kills" in the target area.

In order to demonstrate fully the weapon delivery options of the Assault Breaker concept, a joint test (DARPA and Air Force) of an air-launched version of the standoff missile will be conducted beginning in the first quarter of FY 1982. The test will consist of approximately six launches of the Assault

Breaker missile from manned aircraft. Army T-16 missiles are being modified for air launch. The Pave Mover radar will provide target acquisition and guide the missile to target engagement by the seeker. Submunition dispensing and terminal effectiveness will also be demonstrated during these tests. The air-launched standoff missile flight test will be conducted from October 1981 through March 1982, in a parallel demonstration of the Pave Mover radar capability to guide penetrating manned aircraft for direct attack of targets.

The air-launched phase of Assault Breaker and the Pave Mover program will be transferred to the Air Force in late FY 1982 for further development of the Pave Mover system. Successful completion of the Assault Breaker technology demonstrations will provide a basis for decisions on engineering development for the corps support weapons system by the Army and for the Pave Mover radar by the Air Force in late FY 1982.

2. Technology Base (6.1/6.2) Programs

a. Hybrid Signal Processing. Hybrid signal processing combines the best features of analog and digital components, such as simple binary circuits with programmable analog circuits, to achieve processing gains that are not possible with conventional approaches. For example, it becomes possible to process coherent signals with bandwidths in excess of 100 MHz over virtually unlimited time periods. This technology can be applied to emitter locators, bistatic radars, and low-probability-of-intercept radars with waveforms capable of defeating next generation intercept receivers.

In FY 1980 and FY 1981, specific emitter locator and radar system configurations were developed, predictions for improvements in system performance were made, and laboratory devices were developed and tested. In FY 1982, a full analog/digital signal processor and support system will be developed and laboratory tested in preparation for a field demonstration in FY 1983. Following a successful field demonstration, this program will transition to such programs as the Assault Breaker radar and could form the basis for new intercept receiver and radar design concepts.

b. Cruise Missile Defense. The Cruise Missile Defense program is directed toward development of advanced detection and engagement concepts to counter the next generation cruise missile threat. This threat is characterized by low-altitude flight profiles and low cross-sections. Suppression of ground clutter returns and cross-section enhancement techniques are the principal technical challenges.

In FY 1980 and FY 1981, these detection and engagement concepts were developed and their performance was predicted via simulation and analyses. Powerful clutter suppression techniques were designed and evaluated; critical components, such as analog-to-digital converters, were specified. In FY 1982, the design effort will be completed and promising techniques will be selected for field tests. Following field tests in FY 1984, this program will be transitioned to the Air Force.

c. Bistatic Alerting and Cueing (BAC). BAC is an outgrowth of the Sanctuary Bistatic Radar program described in last year's Congressional Statement. That program held successful field tests in FY 1980 and early FY 1981, and was transitioned to the Army and Air Force. BAC is a joint DARPA/Army program to provide timely and accurate alerting and cueing target information to such battlefield weapons as Stinger, DIVADS, SHORADS, and NURADS. This information is currently not available with the requisite timeliness and accuracy via existing C^3 links.

BAC uses existing monostatic radars, such as AWACS and SOTAS, as the illuminating source, with a small, lightweight, low-cost, bistatic radar receiver colocated with each fire unit or platoon. In addition to the projected improvement in engagement capability, BAC offers survivability improvements, since no radio transmissions are required from the weapon during the surveillance period. It also offers significant potential for an ambush capability.

The 2-year BAC program started in second quarter FY 1981; following successful field demonstrations in late FY 1982 and early 1983, the program will transition to the Army for incorporation into its SHORADS-C^2 testbed.

d. Surgical Countermeasures (SCMs). This is a joint DARPA/Navy electronic warfare program designed to enhance the performance of nearly all types of deception electronic countermeasure (DECM) techniques, which operate against fire control radars and missile seekers. SCM attempts to "close the loop" between jammer and victim so that victim radar or seeker responses to DECM signals are detected and fed back to the jammer in real time. The jammer then uses this new information to control its operating mode, power, and waveforms. The technique applies principally to air-to-air radar combat, air-to-ground suppression of surface-to-air missile missions, and the defense of ships against cruise missiles.

In FY 1980, the SCM concept was successfully demonstrated in the laboratory. In FY 1981, fabrication was initiated for an SCM testbed for field demonstrations. Following successful ground tests in FY 1982 and airborne tests in FY 1983, the program will be transitioned to the Navy (mid-FY 1983).

e. Advanced Indirect Fire System (AIFS) Technology. The AIFS Technology program is a joint DARPA/Army effort to improve significantly the operational capability of cannon field artillery. The primary objective is to overcome the inherent range and accuracy limitations of cannon field artillery by developing and demonstrating advanced technologies in projectile propulsion and guidance and in infrared sensors and millimeter wave radar, autonomous lock-on, terminal homing seekers for cannon fired projectiles. The program will provide a technology demonstration of a lock-on-after-launch artillery projectile.

The fielding of this technology in a fire-and-forget cannon artillery projectile would provide a means to offset the numerical superiority of Warsaw Pact armored forces and artillery to those of NATO and to reduce excessive ammunition expenditures. The capability for autonomous terminal homing would reduce the need for the observer to operate a laser designator for projectile guidance and increase significantly the capability for using unobserved, surprise fires.

This program was initiated in early FY 1979 in cooperation with the Army. Phase I concept definition studies of competing projectile/seeker concepts were completed in October 1980. Two prime contractors were selected for Phase II critical component development and demonstration, which emphasizes competition between two technology solutions to the operational requirements--an 8-inch projectile and a 155-mm projectile. Critical technologies were investigated for ramjet propulsion and flight control for the extended range, 8-inch projectile and system designs were developed for both projectiles. The fire-and-forget seeker concepts that were investigated included a scanning infrared seeker developed under the Air Force's Infrared Guidance Demonstration program, an IIR/FPA being developed under the Tank Breaker program, and two competing millimeter wave radar seekers. Critical issues for all seekers include the ability to survive the shock of being fired from a cannon and the development of microcomputer programs to provide autonomous identification and lock-on to targets and to provide guidance signals enabling the projectile to home on the target.

Phase II of the program continues through the end of FY 1981 with the captive flight test of competing concepts for autonomous, lock-on-after-launch infrared and millimeter wave radar seekers. Seeker developments and tests are coordinated with the Air Force Infrared Guidance Demonstration program, The Tank Breaker program, and the Wide Area Anti-armor Munitions program for the wide-angle self-propelled minimissile. Critical seeker and projectile guidance and control components are being subjected to high gravity (10,000 g) tests in gun firings, as are components of the ramjet boosted 8-inch projectile. The ramjet projectile is being fired from an M110A2 8-inch howitzer to demonstrate the capability for ramjet survival of gun launch, ignition, and powered flight. Projectile guidance and control are also being demonstrated. Evaluation and demonstration of the critical component technology needed to achieve extended ranges with 155-mm autonomous terminal homing projectiles began in January 1981. In 1982, based on the results of the Phase II AIFS evaluation, a single projectile design and infrared and millimeter wave seeker designs will be selected for full-scale demonstration of an autonomous homing, extended range, cannon artillery projectile. Critical components will be integrated during FY 1982 into a full solution autonomous terminal homing, extended range, cannon artillery projectile that will be demonstrated in live firings in FY 1983. Successful demonstration of the technology could provide the basis for an FY 1984 engineering development decision by the Army and permit accelerated development and fielding of fire-and-forget, terminal homing, cannon artillery projectiles for the Army, Marines, and Navy.

F. NUCLEAR TEST VERIFICATION TECHNOLOGY

1. EEMIT or Demonstration Programs

a. Marine Seismic System (MSS) Demonstration. The MSS Demonstration program offers the possibility of monitoring unobtrusively at close distances the most seismically active regions for clandestine underground tests. The only solution to achieving the signal detection and counterevasion verification objectives required for that area is to position monitoring sensors in international coastal waters.

The MSS consists of a high quality, three component borehole seismometer and associated signal conditioning electronics suitable for long-term emplacement in the deep ocean floor. The seismometers will be emplaced in boreholes at a depth of several hundred meters drilled into firm bedrock to achieve the maximum isolation from background noise. Data will be transferred to a central analysis center either by bottom cable or by satellite link. The program will demonstrate the feasibility of installing and operating a state-of-the-art seismic detector in a borehole in the deep (5.6 km) ocean floor and will define seismic detection capabilities of such a system. The MSS will significantly enhance global monitoring of underground/underwater testing under a comprehensive test ban treaty and nonproliferation.

The MSS incorporates advanced sensor technology developed under a parallel DARPA research program. Application of the seismic data recorded by the ocean bottom deployed system to detection, location, and identification of underground explosions will depend on analysis techniques developed under the ongoing DARPA programs in seismic source and signal propagation theory and advanced data processing.

The program was initiated in late FY 1979 and the design for the system was completed at the end of FY 1980. Techniques and specialized equipment required for emplacing the instrument in boreholes in the ocean floor using the drill ship GLOMAR CHALLENGER have been completed. An at-sea test is to be conducted in the mid-Atlantic in March 1981 to verify the operation of this equipment and to gather initial data on the seismic noise reduction in this environment. The sensor and associated electronics required for data acquisition and storage will be developed by early 1982, and deployment of the system is scheduled for the summer of 1982. Full system communications will be added in FY 1983.

2. Technology Base (6.1/6.2) Programs

a. International Seismic Data Center. At present, no facility exists that meets the technical requirements for effective collection, processing, and analysis of seismic data from a global network of diverse stations with widely varying instrument characteristics and data formats. The International Seismic Data Center program supports anticipated international treaty requirements and the need for advanced database handling capabilities to support development of more effective algorithms and signal processing techniques for regional seismic data. A prototype data center is being designed and developed that will be capable of handling the data of national seismic stations (NSS) as well as numerous research stations in the United States and other countries. This data center will incorporate advanced techniques in the collection, integration, processing, archiving, and distribution of seismic data. It will also serve as a testbed to develop new tools for analyzing data for verification and research purposes.

Preliminary design of the data center was completed in FY 1980 and major hardware components for each subsystem were defined and procured. Detailed design was begun for the Seismic Analysis Subsystem, the analysts' work station. During FY 1981, the hardware and software subsystems will be developed and integration will begin. By mid-FY 1982, the first operational version of the data center will be assembled. It will consist of the major subsystems linked together via a local computer network that will be developed in FY 1981. Data from a regional seismic network will be acquired with this system, and testing and enhancements will begin in late FY 1982.

Potential operators of the system include the U.S. Geological Survey (USGS) and the Air Force. The design techniques utilized on the data center will be transferred to the Air Force, USGS, National Oceanic and Atmospheric Administration, and other U.S. agencies with a mission to acquire, process, and distribute seismic data.

b. Yield Estimation Research. This program supports basic research to improve the U.S. capability to estimate the yield of foreign underground nuclear tests using the characteristics of seismic signals recorded at long distances. Fundamental questions about the structure of the earth and the behavior of geologic materials render current seismic estimation of nuclear explosion yields uncertain. The objective of this program is to reduce those uncertainties by theoretical studies that will improve understanding of the physical processes involved in the generation and propagation of seismic waves by explosions and by conducting appropriate experiments to obtain necessary data. Current research is focused on developing a quantitative understanding and improving the methodology.

Past research identified the possible existence of systematic differences in the amount of attenuation of seismic waves. Quantitative estimates of the magnitude of the effect have been developed to correct this. Continuing research efforts are directed toward a refinement of this correction and the development of techniques using seismic data less influenced by this effect. Previously developed models of explosion sources and small-scale laboratory and field experiments are being applied to quantify the effects of near-source geophysical parameters such as rock type, burial depth, and geologic structure that control the amplitude of the seismic signals from explosions. These sensitivity studies are being combined with information from studies of the geological and geophysical setting of U.S. and foreign explosion test sites to determine the effect on the seismic signals and to guide development of more accurate seismic yield estimation procedures.

G. SPACE DEFENSE TECHNOLOGY

1. EEMIT or Demonstration Programs

The Space Defense Technology programs are grouped into two major areas--high energy laser space defense and particle beam technology. The Talon Gold, ALPHA, and LODE projects, collectively called the "Space Laser Triad," are major demonstrations of the three key technologies required for a space-based laser. These three technologies are acquisition, precision pointing and tracking (Talon Gold), high efficiency infrared chemical laser devices (ALPHA), and mirror and beam control optics (LODE). The Advanced Test Accelerator (ATA) project, forming the major testbed portion of the DARPA Particle Beam program, seeks to demonstrate the feasibility of atmospheric electron beam propagation over distances of military interest.

a. Talon Gold. Significant improvements in fire control and precision beam direction must be achieved to enable a laser to be effective in space. The objective of the Talon Gold program is to develop and test the requisite capabilities including target acquisition, tracking, and precision pointing. The space test activities will consist of a low-power laser pointing experiment that utilizes a scaled acquisition, tracking, and pointing payload. The experiments will be conducted as a sortie flight of the space shuttle. The test program will utilize both high-altitude aircraft and space targets to obtain realistic target kinematics, signature, and backgrounds. The performance goals of the experiments represent an improvement in high energy laser pointing and tracking. This experiment will establish the feasibility of achieving required fire control performance levels and will provide the necessary database for design of a first generation laser system.

The Talon Gold program utilizes laser radar techniques developed under its technology base program to achieve the required tracking precision. The potential of this approach was evaluated in a ground-based laser radar tracking program at the MIT Lincoln Laboratory, where enhanced signature satellites were tracked. Extensions of this technique in conjunction with improved inertial reference platforms, sensors, and alignment systems recently developed by DARPA and Service laboratories are expected to enable Talon Gold to achieve the required performance levels.

The Talon Gold program was initiated for DARPA by the Air Force Space Division. The contractors are continuing their activities through the preliminary design phase, including brassboard hardware development. The preliminary design review will be the basis for selecting a single contractor for succeeding phases. The Talon Gold experiment is now scheduled to be launched as part of the Air Force Space Test program. The results of this demonstration will be transferred to the Air Force and Army by direct dissemination of analyses of the design requirements, future system approaches, and potential performance of operational systems.

b. ALPHA. ALPHA is a ground-based chemical laser demonstration intended to establish the feasibility of a laser suitable for space operation. Its objective is to demonstrate the laser device technology in extracting a high power beam. Emphasis in this effort is on the ground-based test and evaluation of a scalable laser.

Near-term mission applications of this program, which forms the laser device technology portion of the "Space Laser Triad," center on the demonstration of the laser device technology. The design concepts for ALPHA integrate resonators, optical bench, and alignment subsystems developed in the technology base program.

Nozzle technology scaling module tests and conceptual designs have been successfully concluded, and two of the three contractors were selected to proceed to preliminary design of the demonstration laser. Engineering drawings and their supporting analyses are being completed. The efforts will conclude with the selection of a single contractor to proceed to detailed design, fabrication, and testing. Following detailed design, fabrication will be initiated and preliminary design of the facility subsystems will continue. This program will transition to the Air Force upon demonstration of system feasibility.

c. Large Optics Demonstration Experiment (LODE). The LODE program will establish the feasibility of large aperture beam control for high-performance space systems. The demonstration hardware will be developed to meet stringent operational system requirements and will be extensively tested in sophisticated ground simulation and test facilities to establish actual performance levels. This program is being developed in conjunction with the companion DARPA technology demonstration programs in chemical lasers (ALPHA) and acquisition, tracking, and pointing (Talon Gold).

The LODE program will integrate significant advances in large mirrors, high-bandwidth fine tracking and beam stabilization, and advanced structures into an ultra-high-performance electro-optical system. A major element of this program is the development and optical testing of a complex mirror, based on advanced technology developments, to meet stringent weight and optical performance requirements. After development testing with a subscale mirror, the beam control system will be integrated and extensively tested in a large-scale thermal-vacuum ground facility that simulates as fully as possible the space environment and the dynamic target engagement.

This effort will contribute substantially to the sequential development of large mirrors and higher performance beam control systems for advanced space lasers.

The success of the LODE program depends considerably on the achievements of technology base programs in large optics technology, adaptive optics, lightweight space structures, and high bandwidth control systems, among others. Of particular note are the excellent results achieved in a series of programs entitled "Large Optics Technology" that established the feasibility of ultra-lightweight "frit-bonded" glass mirrors and thoroughly defined the major trades in fashioning the leading candidates for the LODE mirrors. Other DARPA technology programs in high-speed control system modeling, precise vibration isolation systems, adaptive optics sensors, optical components and coatings, and holographic gratings are the basis for improving beam control performance. Several Military Department programs such as SRAT and ADABECS (Air Force) and SEALITE (Navy) form the foundation and provide the basic technology for the beam control concept currently evolving in LODE.

Dual concept definition studies, aimed at defining the LODE technical requirements, design concepts, and test and simulation hardware have established design requirements traceable to the operational system concept and have provided critical inputs to the process of selecting the primary mirror. Selection criteria have been established in the areas of mirror design trades, production alternatives, system sensitivity to mirror type, and the impact of the mirror decision on test and simulation options. DARPA is now in the process of making the final selection for the primary mirrors. The final design of the LODE hardware and related test program will be initiated with a single contractor. During the years of the actual LODE hardware demonstration, the mirror and beam control technology will be transitioned to the Air Force for ground-based systems integration and ultimate space demonstrations.

d. Advanced Test Accelerator (ATA). When completed at the end of FY 1982, ATA will be a critical experimental tool for demonstrating the scientific feasibility of propagating intense relativistic electron beams within the atmosphere. This device will be the free world's most powerful accelerator. ATA will provide the essential scientific data required by the Services to plan preprototype weapon developments. Initial experiments will evaluate a preliminary propagation mode, and the beam parameters will be modified in subsequent tests to provide assessment of propagation modes that may provide improved performance.

Electron beams, which deliver large amounts of energy at velocities near the speed of light and deposit them deep within a target, offer a wide range of potential applications. These beams could provide point defense of naval assets against nonnuclear threats and defense of hardened sites against nuclear attack and could provide point defense of naval assets and moderately hardened targets against nuclear attack. Theoretical and experimental research programs directed toward demonstrating the propagation of charged particle beams in the atmosphere have been under way for over 20 years. These efforts have been limited to demonstrations of stable beam propagation at low pressures due to the absence of accelerators capable of providing high energy current and pulse repetition rates at sufficient beam energy. Sophisticated theoretical models have extrapolated these data to predict the beam parameters required for stable propagation at atmospheric air densities. In addition, the necessary accelerator technology to produce these parameters has been perfected and demonstrated with the experimental test accelerator at Lawrence Livermore National Laboratory. This technology is now being incorporated into the ATA.

The program to construct the ATA began in mid-FY 1979 and is scheduled for completion at the end of FY 1982. The design of the accelerator was completed during FY 1981. The building and tunnel, which will house the accelerator, as well as most major hardware procurements are being completed during FY 1981. Efforts during FY 1982 will be directed toward assembly of the system components and operational checkout of all subsystems. Work to achieve operation of the accelerator at full specifications and initial beam propagation experiments will be performed in the following year. DARPA is currently working with the

Navy, Air Force, and Army to plan important experiments and to prepare for transition depending on evolving mission requirements and the success of feasibility experiments.

2. Technology Base (6.1/6.2) Programs

The space defense technology base programs establish the necessary basic technology for the more advanced demonstration programs. The objectives of these efforts are to develop (1) the basic technology to permit advances in laser optical components and ultra-precise laser beam pointing; (2) improvements in near-term chemical and far-term visible laser device efficiency, wavelength, and waveform; (3) the scientific feasibility of charged particle beam weapon concepts for atmospheric and space applications; and (4) the utilization of visible blue-green lasers for strategic submarine communications.

a. Advanced Laser Optics. The laser optics technology base program supports new and innovative ideas in the areas of high-performance laser mirrors, optical coatings, optical fabrication of complex resonator mirrors, advanced structural modeling, and sensors and control systems for adaptive optics subsystems. A major element in this program is the Large Optics Diamond Turning Machine (LODTM) being developed and constructed at the Lawrence Livermore National Laboratory for precision optical fabrication of suitable mirrors. This program contributes directly to the optics technology required by the LODE program and the Chemical Laser Device Technology Demonstration program (ALPHA). These efforts also provide the technology foundation for extrapolating to large-scale laser weapon concepts for antiaircraft applications and ballistic missile defense.

The preliminary design for the LODTM was successfully completed in early FY 1981; the final design is scheduled for mid-FY 1981; the construction of the building to house the diamond turning machine is now underway; and the fabrication of machine components will be completed in FY 1982. Several other technology base efforts will yield technology demonstrations in the following areas in FY 1981: beam stabilization using holographic gratings, use of self-referencing Hartmann sensors to provide target imaging data, simulation of complex optical-structural interactions of beam control hardware with computer models, and the feasibility of using thinned multiple mirrors for projection optics in large laser systems. The Small High-power Optics Program (SHOP) has completed preliminary designs on competing small cooled-mirror concepts and the design will be completed in mid-FY 1981, the hardware in early FY 1982, and performance testing by late FY 1982. In late FY 1981 and early FY 1982, new programs will be initiated in the areas of infrared optical coatings, aperture sharing devices, measurements of the vibration output of chemical laser devices, and optical polishing and metrology techniques for conical resonator optics. Technology base results are transitioned continuously to the LODE and ALPHA demonstration programs by formal interface meetings and technical design reviews.

b. Acquisition, Pointing, and Tracking. Advanced space-based lasers will require acquisition, pointing, and tracking performance levels beyond those that are currently projected for the Talon Gold demonstration. Substantial improvements in pointing precision and the development of rapid acquisition and retargeting capabilities will be necessary. In response to these projected requirements, DARPA has initiated advanced technology programs in the areas of advanced acquisition and tracking approaches, target identification, aimpoint selection, and precision pointing mounts.

During the period from FY 1980 to FY 1981, the acquisition and tracking technology base development included the evaluation of a technique for rapid acquisition and tracking using reflections of the high energy laser beam from the target. Improved algorithms for the tracking of faint targets have also been developed. During FY 1981, an advanced precision brassboard model will be completed. Additional acquisition and tracking brassboard activities will be initiated to continue the development of precise, rapid retargeting capabilities.

c. Device Technology (Chemical Lasers). The objective of the Chemical Laser Technology Base program is the resolution of the critical chemical laser device efficiency, wavelength, and waveform. In addition to providing the technology base for the ALPHA demonstration project, this program is continuing to advance component technology with scaled laboratory testing of advanced resonator concepts. Such testing includes evaluation of optical-transfer laser devices and injection-locked concepts.

Laser component testing completed in FY 1980 verified that the high fuel efficiency performance data obtained previously with subscale nozzle arrays apply to high-power laser devices. In addition, unconventional, so-called "source-flow" nozzle concepts have been developed which equal, and in some cases exceed, the performance of conventional nozzles.

In FY 1981, laboratory testing will be completed for the resonator concepts, and physical optics models of annular resonator performance will be validated. In FY 1982, advanced resonators and performance models for chemical lasers will be developed in addition to completion of testing of new annular laser resonator concepts on CO_2 laser testbeds. Gain medium and resonator performance model validation will be completed using data acquired with CO_2 testbeds.

d. Visible Lasers. The DARPA Visible Laser program is directed toward development of the technologies required to demonstrate the feasibility of using long range, ground-based visible lasers for strategic applications.

The major thrusts of the Visible Laser program are development of two techniques with potential for scalability to the efficiencies and power levels required for operational use. Major accomplishments of the FY 1980 program include subscale demonstration for many of the repetitive pulse techniques needed to fabricate a large single pulse laser and preparation for proof-of-principle experiments to demonstrate predicted performance parameters of one of the selected laser techniques. In FY 1981, energy will be extracted from the second selected laser approach to confirm single pulse scaling projections and efforts to demonstrate repetitive operation will begin. In FY 1982 and beyond, both techniques will be progressively scaled to demonstrate operational usefulness. Subsequent experiments will demonstrate scaling to the visible spectrum and will be used to address preliminary system design issues. A visible laser beam control program will also be initiated during FY 1982 to resolve detailed component and system design issues. The Visible Laser program is developing technologies that can eventually transition to all three Services.

H. SPACE SURVEILLANCE

1. EEMIT or Demonstration Programs

a. Teal Ruby Experiment. Teal Ruby is a space-based experiment, incorporating first generation DARPA advanced infrared technology, which will be launched by the shuttle in 1983 and operate in space for a minimum of one year. The sensor utilizes the "staring" concept for detection of dim aircraft targets against the earth's background clutter. Teal Ruby is the primary payload of the Air Force Space Test Program satellite P80-1. The DARPA Infrared Technology program is based on the concept of multimission strategic surveillance from high-altitude space platforms. The stabilization and pointing system of the Teal Ruby Experiment is designed to emulate the geometry of such a platform from a 400-nmi orbit. Because of the lower altitude, a modest sized telescope and a smaller "staring" focal plane can be used. Teal Ruby's primary mission is to provide a proof-of-concept for spaceborne detection of strategic aircraft. In addition, Teal Ruby will provide proof-of-concept for other multimission surveillance functions, develop a comprehensive and global radiometric background data base, and space qualify first generation advanced infrared surveillance technology.

The Teal Ruby Experiment was made possible by technology base programs at DARPA and the Services. Development of the infrared sensitive charge coupled devices (IRCCD) was conducted by DARPA under the STARE program and the HALO technology program. These developments made feasible the fabrication of the Teal Ruby focal plane as the first large-scale implementation of a two-dimensional infrared detector array. The DARPA HALO technology program developed the lightweighting techniques used to design and manufacture the Teal Ruby telescope.

During FY 1980, the automated mosaic detector array tester, a critical element in the manufacture and qualification of the large number of integrated devices required for Teal Ruby, was checked out and certified. A qualification model infrared telescope was fabricated and successfully tested in a simulated space and space-launch environment. The qualification model sensor was assembled and environmental testing at the system level was initiated. In FY 1982, qualification testing will be completed, and the flight model sensor will be assembled, tested, and prepared for integration with the USAF P80-1 satellite for an FY 1983 launch.

The Teal Ruby technology and experiment results will be transitioned to the Air Force via the Advanced Space Application program.

b. Advanced Sensor Demonstration. The Advanced Sensor Demonstration program is a space-based experiment incorporating second generation DARPA infrared staring technology. It is an integrated spacecraft sensor that will be launched to synchronous orbit in 1988 and is expected to function for more than 2-1/2 years. The experiment is sized to allow detection and tracking; the preliminary configuration of the sensor payload incorporates a telescope with optical filters, a focal plane, a cryogenic refrigerator to cool the focal plane, and a processor that controls the system and converts focal plane data into target track information for use by small ground terminals.

The primary thrust of the effort is to provide system level proof-of-concept for a number of military surveillance missions. The flight demonstration of various DARPA technologies designed into experimental subsystems in an integrated surveillance platform is of great value to follow-on operational military systems. Subsequent operational military sensor system developments will also require the database of target signatures and backgrounds being developed in this program. In aggregate, this effort will reduce the cost and complexity of subsequent operational systems. In addition, this experimental spaceborne sensor will be available for observation of critical events anywhere in the world during most of the system's life. The ability to track selected targets will enable an evaluation to be made of the utility of space sensors to strategic and tactical air war scenarios as well as to fleet defense.

Technology development to support this experiment was carried out under the DARPA Space Surveillance and Advanced Optics Project (ST-2) in Program Element 62301E. Component developments for lightweight optics, detector arrays, signal processors, optical filters, and cryorefrigerators were initiated and demonstrated under the HALO technology program. This flight experiment was made possible by achieving major technology milestones in FY 1978 and 1979.

A preliminary experimental concept has evolved and the system requirements review has been completed. Significant intermediate milestones in the cooler, processor, and detector array development programs have also been achieved. A preliminary system design review is scheduled, and detailed system design work will be pursued in preparation for a formal system design review.

2. Technology Base (6.1/6.2) Programs

a. Space-Based Radar. This effort is designed to eliminate the technical risk associated with a space-based, phased array radar. Developments have been in progress since FY 1979 in such critical areas as transceiver modules, antenna membranes, and target identification. The program is oriented to complete component technology and will consider major subsystem development. This technology will contribute to development of an agile beam radar that can detect and track bombers and ships. The primary missions include fleet defense and CONUS air defense. Presently, several major milestones have been achieved: A three-layer antenna membrane has been developed and tested that is considered a breakthrough in space antenna development. In the area of transceiver development, significant breakthroughs have been achieved in the areas of weight and cost. These results have made it possible for this technology to be applied in areas other than space-based radar, e.g., ballistic missile defense and tactical aircraft radars. As a result, this technology is being transitioned to the Services as it develops.

b. High Resolution Calibrated Airborne Measurement Program (HI-CAMP). The HI-CAMP sensor is an advanced, infrared measurement system designed to make high resolution (spectral, spatial, and temporal), two-dimensional measurements of earth backgrounds and mobile and stationary air, sea, and land targets. The HI-CAMP sensor has two types of advanced two-dimensional monolithic infrared arrays with charge coupled device multiplexers capable of providing data in two broad infrared bands. It is integrated into the lower hatch of a high-altitude aircraft to make measurements above most of the earth's atmosphere.

HI-CAMP will demonstrate the infrared charge coupled device (IRCCD) technology and develop a two-dimensional database of high spectral, spatial, and temporal resolution background and selected target measurements. Furthermore, HI-CAMP will provide fundamental atmospheric, target, and background measurement data; assess advanced focal planes, signal processing, and tracking algorithm developments; and support advanced technology programs associated with advanced surveillance concepts. This information is vital to support the Strategic Technology Office advanced surveillance programs such as the Teal Ruby Experiment, the Advanced Sensor Demonstration program, and the HALO Technology program.

The HI-CAMP sensor is the first proof-of-principle for staring mosaic IRCCD sensors and has measured the infrared signatures of aircraft, surface, and sea targets. Many of these measurements were coordinated and supported by the Services. A substantial background suppression factor was demonstrated in FY 1980. A new, more sensitive focal plane will be designed and developed to demonstrate background suppression and to measure dim targets against highly structured backgrounds.

The technology of the HI-CAMP sensor and the data measured are being transferred to the Services via technical direction meetings, reports, and presentations at classified symposia.

c. Monolithic Gallium Arsenide (GaAs) Integrated Circuits (ICs). These circuits are based on GaAs rather than silicon and offer substantial speed and/or power advantages if the problems in fabrication that control circuit yield can be resolved. The DARPA program addresses numerous technology problems in GaAs circuits by executing a program of broad scope covering basic materials advances, novel processing technology, and development of new circuit concepts.

The results of this program will permit space surveillance programs to meet their goals for low-power and high-radiation-tolerant signal processing digital integrated circuits. Furthermore, the process technology underlying the DARPA program of direct ion implantation into semi-insulating GaAs substrates has been adopted industry-wide and is utilized by R&D programs of all three Services and the intelligence community. Solid-state radar transceiver ICs are also evolving from this research and will affect space-based radar, airborne radar, and electronic countermeasures systems. A complete technology for monolithic GaAs LSI circuits and microwave circuits has been demonstrated. Key elements of this accomplishment include a method for qualifying GaAs semi-insulating substrates as IC worthy, use of direct ion implantation into these substrates to form circuit elements, and a truly planar circuit topology that promises high circuit yields. The level of integration has been advanced nearly an order of magnitude during every year of the 3-year DARPA program. The effort has culminated in a fully operational 8 bit x 8 bit multiplier that provides a 16-bit product every 5.2 nanoseconds. Aside from the high speed of these GaAs circuits, their expected radiation tolerance has been verified, i.e., there is no change in operating characteristics after 4 x 10^7 RADs (GaAs) of ionizing radiation. Portions of this program are being transferred to the Strategic Technology Office of DARPA (digital ICs and microwave circuits) (FY 1982) and to the Naval Air Systems Command (microwave circuits) (FY 1981).

I. TECHNOLOGY INITIATIVES

1. EEMIT or Demonstration Programs

DARPA is not currently funding any EEMIT or demonstration programs in this program area.

2. Technology Base (6.1/6.2) Programs

a. Electromagnetic Force (EMF) Gun. The EMF Gun program is jointly sponsored by the U.S. Army Armaments Research and Development Command (ARRADCOM) and DARPA. This program explores uses of alternative electromagnetic propulsion techniques for military gun and launcher applications. The primary purposes of the program are to demonstrate a unique EMF laboratory launcher system to accelerate an appropriate payload, and to develop a subsequent technology demonstration system for air defense, armor, or artillery applications. In principle, the exit speed of projectiles launched by electromagnetic means is not limited, as in the case of conventional gun systems.

By the end of FY 1981, the EMF laboratory hypervelocity launcher system will be assembled and preliminary commissioning tests will be completed. Twin rail guns will be used to launch scaled gliders with high payload efficiencies. New designs for advanced homopolar generators (energy storage systems) were completed in FY 1979; detailed engineering drawings of the generators were completed in FY 1980; and fabrication of a new generator was initiated in FY 1981. Also, projectiles are being launched from linear rail guns. In early FY 1982, the EMF laboratory launcher system will be transferred to the Army/ARRADCOM and will be reassembled in minimum time so that the planned experiments can continue. In preparation for the initiation of the technology demonstrator phase of the program, technical efforts will focus on outstanding relevant component issues.

b. Ballistic Intercept Missile. A technology base is being developed within the Ballistic Intercept Missile program to provide a capability for long range fleet and CONUS defense. Key technologies under development are the sensor and navigation system for control of the weapon during the end-game kill. Three combined sensor and navigation concepts were identified in FY 1980-FY 1981. Development of these concepts will be carried through detailed design. A single concept will be selected for fabrication and flight test prior to transfer of the technology base to the Air Force.

c. Distributed Sensor Networks. The Distributed Sensor Network program is investigating a survivable surveillance concept based on the use of packet radio technology to link together multiple low-cost distributed sensors. The goal of the program is to develop a system architecture that is capable of detecting as well as tracking individual targets such as low-flying air vehicles. A fully distributed low-cost surveillance system offers a nonnodal, highly survivable system that can be installed, repaired, and upgraded modularly. It appears to be the most effective approach for detection and tracking of low-flying air vehicles, and the architecture can be adapted to many other surveillance situations.

A six-node distributed sensor network architecture is under development. The first three nodes will be fielded in FY 1981 for testing. Efficient distributed signal processing algorithms have been developed and will be evaluated in the testbed environment. Distributed machine intelligence techniques are also being developed for situation assessment. The major contribution of this program will be a system architecture for distributed sensor networks, which will be investigated jointly with the Services for application to specific problems involving low-flying aircraft and underwater surveillance.

d. Nondestructive Testing and Evaluation. A scientific foundation for ultrasonic acoustic emission and electromagenetic nondestructive measurement techniques is being developed. This technology, combined with failure models and accept/reject decision criteria, will provide a new capability for increasing safety, reducing costs, and increasing the usability of DoD systems.

This joint DARPA/Air Force effort will emphasize development of these technologies to demonstrate retirement-for-cause as a new method of achieving longer life from F-100 engine disks. This will permit us to obtain the maximum safe life from each system component by discarding only those components that do not have sufficient remaining life for return to service. The current procedure is to retire all engine disks in the fleet after a predetermined amount of time. When this technology is used by the Air Force, the maintenance costs for the F-100 engine alone will be reduced by $5 to $10 million per year.

The conceptual design phase of this program is completed and the development of the specific technologies required to meet the program objectives is under way. In addition to the continuation of the DARPA nondestructive evaluation science base, the retirement-for-cause program will enable the characterization of defects in materials and the evaluation of them against specific requirements. As part of the joint program, the Air Force is supporting a manufacturing technology program to produce the necessary equipment to use retirement-for-cause at an Air Logistics Center in 1985.

e. Distributed Training Technology. The development of an instructional system for wide geographical distribution is based on two technical advances: (1) microprocessor technology to produce small, portable, personalized job performance aids for maintenance technicians and operators; and (2) the application of videodisc technology to the production of ultra-low-cost training simulators for areas such as tank gunnery, ground tactics, and air combat. Sensitivity analyses with a quantitative model of combat readiness and effectiveness indicate that these two areas contribute most heavily to improved job performance and training and, therefore, to improved tactical performance, maintenance readiness, material flow, and combat readiness and effectiveness. Distributed Training Technology addresses the DARPA thrusts of Naval Warfare--through its possible application in an aircraft carrier-based multi-echelon training system--and Land Combat--with the tank gunner simulator.

DoD residential training costs are estimated at $7.2 billion with 15 to 20 percent of DoD personnel involved in training at any point in time, exclusive of such considerations as field exercising, on-the-job training, and factory training. Distributed Training Technology will bring the schoolhouse to the student, greatly improve effectiveness, and significantly reduce training costs and time.

In the training/authoring area, development, evaluation, and transfer of computerized systems have been completed. Prototype development of advanced, intelligent, small, portable, personal job performance aids (e.g., for vehicular maintenance), and the development of prototype ultra-low-cost simulators (e.g., for tank gunnery based on the use of videodisc technology for image display) have been achieved. In FY 1982, testing of the small, portable, intelligent, personal job performance aids and low-cost simulators will be completed in the context of a distributed instructional system for the Services. The job performance aids and simulator technology will be enhanced according to operational test results.

Elements of the Distributed Training Technology program have been and will be transferred to the Services, and training research is closely coordinated on a continuing basis.

f. Teleconferencing Technology. The objective of this program is to develop and demonstrate a low bandwidth video teleconferencing technology for crisis decisionmaking that requires no user training, provides for natural conference control (e.g., directed gaze, gestural addressing), incorporates meeting aids to facilitate group decisionmaking, and satisfies the unique requirements of those crisis situations in which each member of the decisionmaking group is at a different location. This objective is accomplished by the development of a novel video teleconferencing system that simulates, through the use of conferee surrogates to create a shared virtual space, a natural proximate conference in which all of the conferees would be gathered around a common meeting space through the development of a unique image coding algorithm that permits the transmission of video sketches at 9600 bits per second. The illusion of a proximate conference is further enhanced by providing each conferee with a shared graphical workspace or electronic blackboard that can be used to access many kinds of pictorial, graphic, and alphanumeric data, and which also permits the conferees to simultaneously and conjointly annotate visual materials, sketch, and prepare outlines and notes.

Group decisionmaking is an integral part of the command and control process. However, current command and control system design has not directly addressed the problem of how geographically dispersed decisionmakers can be linked for effective group decisionmaking in times of crisis beyond providing a variety of communication means and data management systems. The advanced video Teleconferencing Technology program represents the first serious effort to address this problem, and the development of a technology for the low bandwidth transmission of video provides a means that is both consistent with military operational constraints and economically responsible.

During FY 1980 to FY 1981, a five-station local video teleconferencing system was developed based on the shared virtual space concept. This system incorporates bandwidth compression and advanced media aids for multisource data retrieval, display, data sharing, joint document production, and meeting control. A three-station distributed video teleconferencing system operating over commercial telephone lines also was developed to assist in identifying problems associated with constructing a prototype distributed DoD system. During FY 1982, the design of the local and distributed experimental teleconferencing systems will be enhanced, as indicated by experiments planned for FY 1981 and early in FY 1982 and through the addition of improved bandwidth compression devices and conference aids (most notably, an improved high-resolution electronic "blackboard" and an innovative acoustic management system). Experiments will be conducted with the enhanced systems and a design will be developed for a prototype distributed DoD teleconferencing system during the out-years. In FY 1983, a DoD operational environment will be selected for installation of the prototype video teleconferencing system, and the system will be installed and evaluated in FY 1984.

g. Radial Wafer Blade. The Radial Wafer Blade program is supported jointly by DARPA and the Air Force. Efforts include the development of vastly improved vane and blade alloys for jet engines through rapid solidification rate technology, new cooling designs based on bonded wafers, and demonstration of the process with scale-up to production volume requirements. The program will demonstrate a high durability component for the F-100 engine in the 1985 time frame. In addition to component performance improvements through a combination of rapid solidification technology and more effective component cooling, significant production cost savings and reduced use of critical materials such as cobalt and chromium will be realized.

Accomplishments to date include a significant improvement to the rapid solidification rate powder-making equipment through the installation of a helium gas recirculator. This will greatly expand the powder production capacity and reduce costs. Two radial wafer blades have been run in an F-100 test engine, including 25 Tactical Air Command full mission cycles. Blade alloy optimization studies have resulted in a tenfold improvement in oxidation resistance without sacrificing high-temperature strength. A vane alloy has been developed that has intrinsic oxidation resistance that is better than many coatings that are currently used. Rapidly solidified alloys have exhibited the ability to be cold-rolled to final wafer thickness, which will lead to improved process control and further cost reductions. Transition plans include component performance demonstrations in an advanced turbine engine and development of complete component processing specifications.

h. Space Signal Processing. The Space Signal Processing program is designed to develop an advanced onboard signal processor (AOSP) that is optimized to support military space missions through the year 2000. The processor will have multimission capability; will be power, weight, and volume conservative; and will be able to survive 10 years in space without performance degradation. For surveillance missions, this processor is designed to process the raw data onboard the satellite and to relieve the communication system of the need to transmit large amounts of data, thus greatly decreasing the space resources allocated to the communication function. For communications missions, this processor will enable considerable sophistication in beam agility, null forming and steering, spread spectrum coding, and multiple access, all of which will protect the communication system from jamming and other electronic countermeasures.

This processor was initially designed to process the raw data for space-based radar. As the design matured, it became clear from analyses that the design was general enough to encompass all of the known space signal processing requirements foreseen through the year 2000. The initial design of the processor has been completed at both the register and gate levels and includes several levels of support simulation. Breadboard construction has begun on the array computing element, which is the building block in the AOSP design. Efforts have also started on GaAs circuit development to provide greater capability and higher radiation resistance.

This program is a jointly funded DARPA/Air Force effort as part of the Air Force Space-Based Radar program.

i. Fiber Optic Sensor Systems. The Fiber Optic Sensor Systems program is a joint Navy/DARPA directed research effort to exploit the effects of various energy fields on the optical signal in a fiber waveguide. The thrust of the program is to improve passive detection, localization, classification, and tracking of energy weapon platforms using an entirely new class of multifunction (i.e., acoustic, magnetic, thermal, and rotational) sensors with the potential for direct coupling to optical cabling and high-powered optical processors. These sensors will be geometrically flexible, lightweight, low cost, reliable, extremely sensitive, and invulnerable to electromagnetic/radio frequency interference and electromagnetic pulse.

To date, the program has (1) demonstrated better than sea-state zero equivalent noise performance in an acousto-optic glassboard (i.e., optical breadboard) sensor by replacing laboratory optical components with state-of-the-art optical devices; (2) improved minimum detectable acoustic pressure in fibers by 2-1/2 orders of magnitude; (3) enhanced the acousto-optic coupling coefficient of coated fibers by more than an order of magnitude; (4) demonstrated laboratory magneto-optic sensor capability within 5 dB of theoretical prediction; and (5) demonstrated unique opto-electronic components for generic sensor applications.

The DARPA-funded materials research, conducted by the Tactical Technology Office and the DARPA Defense Sciences Office, will transition to the Navy's Fiber Optic Sensor Systems exploratory development in FY 1983.

j. Target Penetration Research. Basic research has been initiated during FY 1981 to provide fundamental improvements in shaped charge warhead and kinetic energy penetration technologies. The research is being conducted to expand scientific knowledge and to provide a technology base for improved warhead and penetrator effectiveness. The new warhead concepts being investigated offer a potential to significantly improve terminal performance against advanced armor arrays.

k. Technology Innovation Search. With the current emphasis on achieving technological superiority to offset Warsaw Pact weapons and manpower, it is imperative that DoD be cognizant of the military-oriented research and development work that is being conducted by industry and universities that are beyond the purview of DoD. DARPA has, therefore, established a program to aggressively search for and exploit evolving commercial and university research that has military applications. This program, in effect, increases the level of military R&D funding or extends the effect of existing research resources by introducing new and creative ideas into the DoD mainstream--ideas that might have never surfaced without extensive, duplicative DoD efforts.

The Technology Innovation Search program was initiated in February 1980 to identify, review, and transfer selected U.S. commercial technology to DARPA or the appropriate Service laboratories for application to specific defense problems. The results from this program are expected to provide a significant military research resource multiplier. For example, recently discovered commercial developments in ceramic fibers and in reinforced injection molding processes relate directly to aircraft design and defensive weapons systems and help to eliminate redundant, overlapping research efforts.

A significant portion of the U.S. industry does not perceive military markets as sufficiently rewarding to offset the frustrations and burdens imposed by DoD regulations and paperwork. Military research programs are often viewed as less certain, slower to obtain, intermittent, and restrained in profit. These factors have served to block the transfer of commercial technology to DoD. DARPA's innovative search methodology offers a structured search for technical innovations or concepts within the private sector that alleviates many of the negative psychological barriers that the non-DoD industrial sector has encountered and, thereby, expedites the transfer of technology to DoD.

Some promising matches that are evolving rapidly are (1) the initiation of ceramic fiber technology transfer to the Army Ballistic Research Laboratory; (2) the submission of five proposals to DoD and other federal program managers on the subject of high-power solid-state lasers; and (3) in the area of reinforced reaction-injection molding, the consideration of mixing technology in mold for potential application to a DARPA investigation of liquid propellant gun techniques.

During FY 1981, DARPA sought to try out and adopt new methods for the Technology Innovation Search program to screen technologies more precisely and to strengthen the technology transfer mechanism. DARPA and Service laboratories are being exposed to commercial technologies at near zero cost and are increasing their application of private sector research.

1. Machine Intelligence. Machine intelligence research combines fundamental investigations of the limits of the digital computer's capabilities for intelligent information processing with relevant military concept demonstrations. The program is developing ways to acquire large bodies of specialized knowledge in computers and to efficiently bring that knowledge to bear on the complex and dynamic problems of situation assessment, planning, and control in the command and control environment. The goal is to make it possible for computers to assist and/or relieve military personnel in complex or routine decisionmaking tasks that are information intensive, personnel intensive, tedious, dangerous, or in environments that can present unexpected situations.

Success in this effort will amplify our ability to interpret and act upon information in many forms--text, imagery, sensor signals, databases--in an intelligent and timely manner. Military applications of the technology include intelligent remote sensors, cartography, adaptive network communications, and a wide range of command and control situations.

A bootstrap stereo technique has been developed that extracts terrain information from a sequence of images taken from a single camera mounted on a moving platform. A system that permits natural language access to distributed databases has been demonstrated and is being adapted for portability. A knowledge-based system for automatically integrating multisensor data from electronic warfare was developed and tested; its performance matched or exceeded that of a human's ability to interpret and respond to incoming data. In FY 1982, there will be a concept demonstration for an automated intelligent system for tactical air battle management, and an intelligent display-based information presentation system will be completed that includes a natural language interface for control of the display format.

This technology is being transferred to the Services through testbed programs such as the ACCAT and the cartographic work station being developed jointly by DARPA and the Defense Mapping Agency.

m. Very Large Scale Integration (VLSI) Research. The VLSI research program is developing methodologies, innovative architectures, and computer-aided design and process simulation tools to exploit VLSI technology. Custom VLSI chips are being designed and fabricated to explore innovative architectures; the goal is to develop VLSI systems with a million or more gates on a chip that represent fundamental advances in processing capability. Fundamental research on critical silicon VLSI fabrication processes will provide scientific insight and lead to increased circuit yield and reliability.

The circuit design and fabrication times and the cost of providing custom VLSI chips for military systems will be significantly reduced through the use of network-based design methodologies, support systems, and process simulation aids being developed under this program. Various innovative architectures such as the tree machine and the geometry engine are being explored to exploit VLSI technology. When combined with advanced processing control capability, these will lead to signal/data processing systems having small power, weight, and volume requirements, but with orders of magnitude greater processing capabilities than current LSI techniques permit.

A new ultra-high frequency transistor, called the permeable base transistor (PBT), is believed capable of operating at frequencies above 500 GHz. A preliminary version of the PBT has been developed and demonstrated to operate at frequencies above 30 GHz. A technique has been developed for restructuring a large-area integrated circuit after initial fabrication, and in FY 1982 it will be used to demonstrate restructurable logic with a 100,000 transistor circuit. A new computer architecture called a tree machine is being developed for highly parallel computations, and a working version will be demonstrated in FY 1982. More than 150 copies of the second edition of the silicon process simulation program have been distributed to and are in use by DoD agencies, government laboratories, and their industrial and university contractors. Significant new scientific insight has been gained into the physical processes controlling silicon oxidation, the most important circuit fabrication step. Concepts are being transferred directly to U.S. semiconductor industries as they are developed. Several industries already are using the process simulation program for commercial purposes The smallest feature (0.1 micron) silicon transistor ever fabricated was realized through a highly innovative process technology that uses conventional optical lithographic techniques. The feasibility of using highly focused ion beams to fabricate submicron feature devices without the use of photomasks was demonstrated.

n. Particle Beam Technology. The objective of the Particle Beam Technology program is to determine the scientific feasibility of both charged and neutral particle beam concepts. The critical issue for charged particle beams is to demonstrate stable, predictable propagation of relativistic electron beams in the atmosphere. The thrust of neutral particle beam research is to demonstrate the capability of generating low-divergence beams for potential space applications.

Particle beams offer the capability to rapidly deliver large amounts of energy and deposit them within a target to provide high kill probability. Potential applications of charged particle beams include antiship missile and hard site defense. Neutral particle beam potential space applications include ballistic missile defense.

Charged particle beam research efforts have provided experimental data at low electron beam energies and low gas densities. These data have been extrapolated by means of sophisticated theoretical models to predict stable propagation in the atmosphere. This research has also provided the advanced high-current linear induction accelerator technology that is essential to demonstrate propagation at full atmospheric air densities. Advanced accelerator technology has been evaluated and perfected during FY 1980 and 1981 with the experimental test accelerator at Lawrence Livermore National Laboratory. This device, which has operated within 90 percent of the design goals of beam current, forms the basis for the design of the Advanced Test Accelerator Demonstration program, as well as providing an experimental facility for the completion of low pressure electron beam propagation research during FY 1982. The neutral particle beam research program, which was transferred to DARPA from the Army in FY 1981, focuses on theoretical and experimental studies to minimize beam divergence in radio frequency ion beam accelerators. An accelerator test stand, which is being constructed during FY 1981 and 1982 at Los Alamos Scientific National Laboratory, will provide the essential experimental tool for evaluating critical beam divergence issues for the initial stages of potential high energy neutral particle beam systems.

DARPA is currently working closely with the Air Force and Army to plan important experiments and to prepare for transition, depending on experimental results and evolving application requirements.

III. UNIFIED AND SPECIFIED COMMAND ASSISTANCE

DARPA technology investment demands that our programs have high military utility against future threats and contribute meaningfully to the U.S. technology base. Within selected DARPA programs, the opportunity exists to apply results at the request of Unified or Specified military Commanders. Recent discussions with CINCPAC, CFC-K, EUCOM and SAC Headquarters have resulted in requests for DARPA recommendations for technology application in several mission areas.

A. PACIFIC COMMAND (PACOM) AND CFC-K

As indicated in Section I, automated message handling experiments were conducted at Hq PACOM to assess the utility of providing interactive computer message handling for the Unified Commander. These experiments, operated at the secret message level, were conducted by CINCPAC personnel. Significant command/control time savings were noted. At the request of CFC-K, an assessment of Command defensive capabilities was made. It indicated that DARPA-developed technology could improve needed surveillance, targeting, and communication capabilities. The following technology areas were assessed and resulted in recommendations.

1. Surveillance, Targeting and Communications

There are a number of programs in the process of being transferred to the Services that can fulfill expressed CFC-K mission needs for wide area, long duration surveillance; detection and validation of fixed and moving targets; and high volume tactical communications and data processing in an electromagnetic combat environment. The following demonstrated technologies are considered feasible and appropriate candidates for application to CFC-K needs.

a. Focal Plane Array (FPA) Technology. The extension of infrared surveillance, target acquisition, and tracking to new classes of important military targets has been made possible by the revolutionary DARPA development of infrared charge coupled device (IRCCD) technology. Single integrated chips containing a large number of infrared detectors have been packaged into multi-element FPAs that have demonstrated an increase in sensor sensitivity. The reduced size and weight and improved performance of sensors utilizing FPA technology are being applied to tactical target acquisition (see item II.E.1.a). Further application to remote target sensing for land combat applications can be accomplished to provide a substantial improvement in survivability as well as target acquisition and tracking for fire support elements.

b. Netted Radar. A joint DARPA/Army Netted Radar program was initiated during FY 1978 and successfully demonstrated at Ft. Sill during FY 1979 (refer to item IV.h). The improved capabilities that can be achieved by applying advanced digital signal processing technology to ground surveillance radars by netted operation include increased coverage and reduced vulnerability to countermeasures. This technology is being incorporated into the Army Netted Universal Radar program.

c. Packet Radio. Experimental packet radio technology has been developed and demonstrated to provide computer-aided communications for mobile users. The DARPA/Army packet radio experiment (refer to item II.C.1.b) is in daily use in garrison at Ft. Bragg and will be used to support field exercises through 1982. The impact of a mobile data communications capability on operations and access to remote automatic data processing capabilities have been significant. Application of this technique can provide a reliable, antijam and anti-intercept data communication capability for C^2 at the corps and higher echelon headquarters. In addition to these DARPA developments, a netted ground and airborne radar network was recommended that would operate with a commercially available but developmental target analysis and planning system (TAPS). This equipment consists of a low-cost tabletop computer, computer memory systems, and a display that provides essential fusion of critical tactical C^2 information. This system was successfully evaluated in the NATO exercise ABLE ARCHER during November 1980.

2. Hard Structure Munitions

Selected munitions were adopted by Sandia Laboratory for the Pershing II earth penetrator and can be delivered by surface-to-surface rockets, aircraft, and artillery. By using precision guidance, only a small inventory would be required.

B. EUROPEAN COMMAND (EUCOM)

DCINC/EUCOM requested an evaluation of the EUCOM logistics system and recommendations on the appropriate application of information processng technology. A proposed testbed logistics network was designed that would link several U.S. sites in Europe. Interactive access to geographically distributed logistics computers would be provided for substantially improved logistics management. If the testbed is approved, funding and implementation will be provided by EUCOM. The availability of PACOM message handling experimental data to EUCOM J-3 was a significant help in the specification of EUCOM automated logistical message handling and the ultimate design of the testbed.

C. STRATEGIC AIR COMMAND (SAC)

A detailed discussion of DARPA information processing technology recommendations to Headquarters, SAC, is provided in item II.C.1.c. These recommendations are directed toward a desired order-of-magnitude improvement in management of mission planning and execution in the post-1990 period. As indicated in Section II, the worldwide distribution of C^3 forces will require intensive use of automated information collection, storage, and processing to provide SAC with realistic mission options in the 1990s.

IV. PROGRAMS TRANSFERRED

a. Ultraviolet/Visible Laser Components. The Ultraviolet/Visible Laser Components program investigated and identified candidate mirror substrate materials, window materials, and coatings for use in high energy excimer lasers operating in the ultraviolet or visible spectral region. The component technology will be transferred as part of the Ultraviolet/Visible Laser program, funded by the DARPA Directed Energy Office, to the Air Force for strategic space applications and to the Navy for submarine communication by conversion to the blue-green wavelength.

b. Teal Amber. The Teal Amber program has developed and demonstrated an advanced visible IR sensor technology suitable for rapid search surveillance of very dim space objects from a ground-based telescope. Unique mosaic focal plane and signal processing devices were developed for an experimental sensor system. Two field demonstrations of the camera system were successfully completed at the Air Force Experimental Test Site at Socorro, New Mexico. Plans for transfer of the experimental sensor and supporting equipment to the Air Force for operational use at the MOTIF site on Mt. Haleakala, Maui, are being made. This will complete the transfer of the program to the Air Force.

c. Compensated Imaging. About one-half of the DARPA Maui Optical Station was transitioned to the Air Force Aerospace Defense Command at the end of

FY 1979. Because of the current projected use of the remaining portion of the facility, primarily in support of the compensated imaging field unit and laser beam propagation experiments, the remaining portion will not be fully transitioned; rather, it will be operated as a cooperative R&D facility with the Air Force. Joint operations between DARPA and the Air Force over the past year indicate that this will be a very workable relationship.

d. Teal Ruby Experiment. Transition of the Teal Ruby Experiment to the Air Force is continuing. The Advanced Space Applications program, funded by the Air Force, will provide for detailed analysis of Teal Ruby data in the context of a possible operational air vehicle detection system. Contractual work on data and analysis began in FY 1981 with participation in mission planning. In FY 1982, the Teal Ruby Experiment will be delivered to the Air Force for integration on the P80-1 spacecraft.

e. Large Optics Materials. The Large Optics Materials program is developing materials for large-scale mirrors for space surveillance and high energy applications with low coefficients of thermal expansion. The materials technology developed under this program will be transferred with the Large Optics program funded by the DARPA Space Defense Technology program.

f. Hydrogen Fluoride (HF)/High Energy Laser (HEL) Film. The purpose of the HF/HEL Film program was to develop coatings for optical components such as mirrors and windows in high energy HF/deuterium fluoride lasers operating in the infrared spectral region. This technology has been transferred to the Air Force Weapons Laboratory where research programs are currently in progress.

g. Seaguard/Acoustic Research Center (ARC). The ARC advanced acoustic signal processing testbed will officially transfer to the Navy Undersea Surveillance Office at the end of FY 1982. This gives the Navy a unique and proven facility capable of developing advanced computer data processing algorithms using actual sensor information without degrading operational capabilities. DARPA will continue to support advanced technology development at the ARC, but the future facility development and direction will be provided by the Navy.

h. Netted Radar. This program was initiated in FY 1978 to improve acquisition of tactical ground targets over wide geographic areas through the use of netted radars. The system concept was successfully demonstrated at Ft. Sill in FY 1979 with two modified PPS-5 radars; and again in FY 1981 with the PPS-5 radars, a TPQ-36 mortar locating radar, and an airborne radar simulating SOTAS. The following targets were automatically detected, tracked and located: moving vehicles, personnel, helicopters, shell bursts, and jammers. The key to these demonstrations lies in the development of a compact, moving target indication digital signal processor for ground clutter suppression. This development yielded a "clean screen" display, which allowed narrow-band (voice grade) data transmissions and subsequent track correlation/formation at a central site. Following the FY 1981 field demonstrations, the program was transferred to the Army, which has incorporated the technology into its Netted Universal Radar program.

i. Computer-Based Indication and Warning Systems. Two quantitative, interactive, computer-based monitoring and warning systems are being used to provide U.S. Commands with a different perspective on situations of current concern and for monitoring and warning. FY 1981 performance evaluations of the systems using classified data will have a significant effect on a decision to maintain them.

j. Counter-Terrorism Technology. The Terrorism Research and Analysis Project (TRAP) currently consists of a database and an interactive, microprocessor-based information storage and retrieval system that serves as the research foundation for counter-terrorism decision-aiding models and for an indications and warning prototype system. The TRAP data, software, and research results are being incrementally transferred to DA/SOFD-D, JSOC, OJCS/PSYOPS, DNA, EUCOM/SOTFE, MAC, and DOE. Uses include training, monitoring, contingency planning, and storing user data.

k. Battlefield Exploitation and Target Acquisition (BETA)/Coherent Emitter Location Testbed (CELT). The BETA program is a joint DARPA/Army/Air Force effort to develop and subsequently acquire a tactical correlation/fusion center that accurately reflects the air/ground combat situation in near-real time. The testbed consists of two correlation centers (one tailored for use at the tactical Air Force level and the other at Army Corps level), a communication system, and a number of remote display systems to provide interaction between the correlation centers and other users. CELT was a joint program to develop a system to accurately locate narrow-band communication emitters for eventual exploitation. Both the BETA and CELT technologies were transferred to the Army and Air Force in FY 1981. The BETA technologies transferred were primarily the computer software capability to merge information from different databases into a coherent view of the battlefield. The CELT effort transferred the technology required to accurately locate narrow-band communication emitters based on a single intercept.

l. Active/Passive Location. This program is an effort to locate, classify, and target critical nodes in the first and second echelon. Critical nodes include such force elements as nuclear support centers, air defense command posts, fire support and maneuver command posts, assembly areas, choke points, reconnaissance and radio electronic centers, and others. Many critical nodes will be classified by simply plotting the type and number of emitters and their approximate location on the battlefield. Other nodes will require confirmation to provide node classification because not all nodes have unique signal characteristics. The FY 1981 effort will consist of a detailed system study to define the engineering requirements and will be jointly funded by DARPA and the Air Force.

m. Radial Wafer Blade Technology. The Radial Wafer Blade Technology program is being transferred to the Air Force over a period of several years through joint funding. DARPA is providing funds for program research to demonstrate that the radial wafer blade can operate in the F-100 engine for a longer time, at a higher temperature, and for a lower production cost than current generation blades.

V. PROGRAMS TERMINATED

a. Oceanographic Detection and Categorization System (ODACS). During FY 1980, DARPA terminated the ODACS program. Program objectives included the fabrication of a high-power blue/green laser radar and the installation of this unique device in an appropriately modified aircraft. The laser radar development was found to be more complex and costly than originally anticipated, and the power level precluded the achievement of program test and evaluation objectives. The technology developed from this program is being applied to the DARPA Strategic Laser Communications program.

VI. DARPA FISCAL YEAR 1982 BUDGET REPORT SUMMARY

A. OVERVIEW

We are requesting $655.0 million to implement the R&D program thrusts, as outlined in Section II, which represents an increase of $96.4 million over our approved FY 1981 appropriation. As shown in the following Budget Summary, this provides real growth of nearly 8 percent over FY 1981. DARPA's real growth over the past 10 years has been 4.4 percent per year.

BUDGET SUMMARY

	Agency Fiscal Year ($ in millions)			Agency Trends % Real Growth	
				FY 72-82	FY 81-82
				(Constant)	
Major Programs	1972	1981	1982	(FY 72 $)	(FY 81 $)
Research	35.4	97.7	95.0	2.5%	(10.5%)
Exploratory Development	173.7	256.4	313.8	(1.6%)	12.6%
Experimental Eval Projects	--	197.7	238.4	--	10.9%
Mgmt Hdqtrs	3.3	6.8	7.8	0.1%	5.5%
TOTAL AGENCY	212.4	558.6	655.0	4.4%	7.9%
Agency budget as a percentage of DoD Science and Technology Program	14.7%	17.5%	17.3%		

The major contributor to this growth has been the Experimental Evaluation of Major Innovative Technologies (EEMIT). With respect to the overall DoD Science and Technology Program, the DARPA portion is about 2.6 percent higher than it was 10 years ago.

Of the $96.4 million increase requested by DARPA, $40.7 million is for EEMIT. This program element contains projects aimed at demonstrating key technologies that hold the promise of options for revolutionary new system capabilities. The programs that account for this increase are Forward Swept Wing, X-Wing, the Advanced Sensor Demonstration, the High Energy Laser Space Defense projects, and two new programs transitioning to the demonstration phase in FY 1982--Tank Breaker and Indirect Fire Cannon.

Other major increases in the long-term Exploratory Development area that should be highlighted are:

- An increase of $27.2 million in the Strategic Technology program element. This supports the expansion of the Acquisition, Tracking and Pointing Program; the Ballistic Intercept Missile Program sensor development; and technology efforts for strategic deterrent programs that will require hardware procurements for testing.
- $19.0 million in the new Particle Beam Technology program element, which has transferred the Charged Particle Beam project from Basic Research (6.1).

The table below summarizes our budget request by program element:

PROGRAM ELEMENT FUNDING SUMMARY
($ in millions)

		FY 1982 Descriptive Summary		
Program Element	Title	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate
61101E	Defense Research Sciences	97.7	95.0	100.5
	Materials Sciences	24.1	31.6	33.1
	Advanced Systems Materials	(9.7)	(13.6)	(15.3)
	Electronic & Optical Devices	(14.4)	(18.0)	(17.8)
	Cybernetics Sciences	10.6	14.2	14.5
	Computer & Communications Sciences	27.3	34.2	37.1
	Intelligent Systems	(14.1)	(16.3)	(17.5)
	Advanced Digital Structures and Network Concepts	(13.2)	(17.9)	(19.6)
	Tactical Technology Research	5.3	13.1	13.5
	Unconventional Detection Research	(3.8)	(8.6)	(9.0)
	Target Penetration Research	(1.5)	(4.5)	(4.5)
	Charged Particle Beam	28.6	--	--
	Geophysical Research	1.8	1.9	2.3
62101E	Technical Studies	3.1	3.2	3.3
62301E	Strategic Technology	111.9	139.1	154.2
	Advanced Strategic Concepts & Strategic Technology Analysis	(3.0)	(1.0)	(2.6)
	Space Surveillance and Advanced Optics	(19.4)	(16.5)	(11.2)
	High Energy Laser Technology	(21.3)	(38.6)	(39.4)
	Strategic Deterrent	(3.8)	(8.1)	(10.9)
	Strategic Delivery Vehicles	(28.5)	(37.0)	(44.4)
	Warning Technology	(9.0)	(8.2)	(6.3)
	Space Application Technology	(2.9)	(6.9)	(6.1)
	Space Object Identification	(3.2)	(2.6)	(2.1)
	Strategic Laser Communications	(20.8)	(20.2)	(31.2)
62702E	Tactical Technology	80.0	81.8	96.7
	Target Acquisition & Engagement	(17.2)	(19.1)	(15.5)
	Weapon Technology & Concepts	(31.8)	(32.7)	(33.6)
	Ocean Monitoring & Control	(31.0)	(30.0)	(47.6)
62707E	Particle Beam Technology	--	19.0	20.1
62708E	Integrated Communications and Control Technology	35.3	41.6	44.2
	Distributed Information System	(13.9)	(16.1)	(17.4)
	Advanced Communications & Control & Communications Technology	(19.1)	(23.0)	(24.3)
	Systems Cybernetics Technology	(2.3)	(2.5)	(2.5)
62711E	Experimental Evaluation of Major Innovative Technologies	197.7	238.4	233.7
	Teal Ruby Experiment	(23.5)	(20.2)	(8.2)
	X-Wing	(2.9)	(12.9)	(3.5)
	Advanced Command & Control Architecture Testbed & DMA Testbed	(4.0)	(3.2)	(1.4)
	Technology Assessments	(1.6)	(1.7)	(1.7)
	Advanced Sensor Demonstration	(17.3)	(40.8)	(64.3)
	Space Acquisition, Tracking and Pointing Experiment - Talon Gold	(18.3)	(21.5)	(26.6)
	High Power Chemical Laser Ground-Based Demonstration - ALPHA	(18.6)	(22.5)	(25.7)
	Forward Swept Wing - Demonstration	(7.0)	(18.5)	(23.5)
	Assault Breaker Demonstration	(51.8)	(10.0)	--
	BETA/CELT Demonstration	(1.4)	--	--
	Large Optics Demonstration Experiment - LODE	(11.2)	(15.2)	(16.7)
	Indirect Fire Cannon	--	(10.0)	(7.0)
	Tank Breaker	--	(23.4)	(13.0)
	Classified Programs	(40.1)	(38.5)	(42.1)
62712E	Materials Processing Technology	11.9	13.5	14.0
62714E	Nuclear Monitoring	14.2	15.6	16.5
	Detection & Discrimination Research	(8.2)	(10.1)	(8.6)
	Yield Estimation Counterevasion Data Analysis & Processing Research	(6.0)	(5.5)	(7.9)
65898E	Management Headquarters (R&D)	6.8	7.8	8.1
	TOTAL DARPA	558.6	655.0	691.3

B. MAJOR THRUST DESCRIPTION

The following discussion provides more detail on key efforts in the DARPA program. In each case, the funding change is identified by major thrust with a description of the thrust and the major programs that make up the increase. A summary of the DARPA program by major thrust is provided below:

MAJOR THRUST SUMMARY
($ in millions)

Major Thrust	FY 81	FY 82	Change
Naval Warfare	38.2	51.1	+12.9
Air Vehicles & Weapons	43.0	55.0	+12.0
Command, Control & Communications	75.8	85.5	+ 9.7
Advanced Cruise Missile	45.9	56.9	+11.0
Land Combat	98.6	84.2	-14.4
Nuclear Test Verification	16.9	17.6	+ 0.7
Space Defense	70.2	98.0	+27.2
Space Surveillance	75.6	92.9	+17.3
Technology Initiatives	87.6	106.0	+18.4
Management & Support	6.8	7.8	+ 1.0
TOTAL DARPA	558.6	655.0	+96.4

1. Naval Warfare

This thrust investigates new technologies and concepts to improve the performance of passive acoustic systems, develop active acoustic surveillance technologies, and explore nonacoustic submarine signatures and long-range, over-the-horizon surveillance of air, surface, and submarine targets. The thrust increase is related to nonacoustic ASW, and advanced undersea vehicle programs.

2. Air Vehicles and Weapons

This addresses innovative concepts such as the X-Wing and the Forward Swept Wing technologies, air breathing missiles, and rapid solidification of super alloys, which could offer dramatic improvements in aircraft performance. Increases relate to these programs and the convertible engine program.

3. Command, Control and Communications

Covered in this thrust are technologies for strategic laser communications, survivable computer communications, secure message and information systems, improved crisis management and command systems, and evaluations of these emerging technologies for efficient inter- and intra-theater communications and battle management in a quasi-operational testbed. The Low-Cost Packet Radio C^3 systems architecture, system and network security, and spatial database management programs account for the increase in this thrust.

4. Advanced Cruise Missile

This thrust area investigates engine improvements for greater range and payload, enhanced homing, and guidance technologies to improve accuracy, advanced engine cycles, and the understanding of detection and tracking phenomena to maintain the ability of cruise missiles to penetrate a sophisticated air defense. The thrust increase is attributable to detection technology, engine development and propulsion, and power materials programs.

5. Land Combat

This thrust area covers a spectrum of target acquisition and weapon delivery technologies that provide new capabilities. These technologies are incorporated within advanced fire-and-forget missiles, advanced anti-armor warheads, Assault Breaker, all-weather targeting and guidance, and low-cost, longer range artillery rounds. The Tank Breaker, Indirect Fire Cannon, Guided Anti-armor Mortar Projectile, Advanced Armor, and Penetrator Warhead programs account for the increase, which is more than offset by the decrease in the Assault Breaker program.

6. Nuclear Test Verification

Developments in methods and data analysis techniques for remotely determining the characteristics of nuclear tests and for verifying other nations' compliance with agreements limiting nuclear testing are addressed in this thrust area. The increase relates to efforts in the explosion field experiment, ocean-based surveillance, and advanced detection sensor areas.

7. Space Defense

This thrust focuses on high efficiency lasers, large space optics, and pointing and tracking techniques to demonstrate the feasibility of high energy laser system technology for space-related applications. Program increases are in the various laser component efforts.

8. Space Surveillance

This thrust addresses development of selected sensor technologies for target detection, improved missile surveillance, and new options for early warning on both strategic and theater levels. The Advanced Sensor Demonstration and the Teal Ruby program account for the increase in this thrust.

9. Technology Initiatives

This thrust includes programs such as innovative computer science; new communications technology; development of charged particle and neutral particle beam technologies to demonstrate the feasibility of propagating a high energy beam through the atmosphere; application of image understanding techniques to photo-interpretation automation; initiatives in digital structure designs, cruise missile defense, electromagnetic propulsion and electronic and optics materials research; and "seed bed" technology programs. Increases are related to advanced digital structures, electromagnetic gun, artificial intelligence, cruise missile defense, space signal processing, PACSAT, VLSI circuits, and materials research efforts.

10. Management and Support

This thrust provides for the management and administration of Headquarters personnel including salaries, rent, travel, supplies, and equipment.

INCREASE IN R. & D. REQUEST OVER 1981 BUDGET

Senator STEVENS. Thank you very much. Senator Stennis, do you have some questions? I have used my time already.

Senator STENNIS. Well, I am going to be quite brief, Mr. Chairman, but I do want to make sure I have understood some points.

You are asking for $90 billion now for DOD research and development and engineering and acquisition activities. That is your opening sentence here, Dr. Wade.

Dr. WADE. Yes, sir.

Senator STENNIS. That is the total amount of money of course. How much above the 1981 appropriation you might say is that in round numbers?

Dr. WADE. The procurement account last year was $51 billion. The request is to increase that to $68 billion. On the R. & D. side, the number last year was $16.7 billion and this year $21.7 billion. The average increase, as I indicated, was like 30 percent, 21 percent on the R. & D. account and like a little bit over 30 percent on the procurement account.

Senator STENNIS. We need something that will give us a figure for just what I call R. & D. You gave those figures there. From $16 billion you are asking to jump that up to how much?

Dr. WADE. $21.7 billion.

Senator STENNIS. Now, let's group it between that and the $90 billion figure. What all does that include? Describe it. I really want to get a handle on that so I will understand a little better. As the chairman says, we are called on to explain this to other members.

Dr. WADE. In the strategic area, as I noted, a major item is funding for the new bomber. There is a substantial increase in the strategic area toward improving the enduring quality of our command and control systems. That is a very important part of the makeup of our whole strategic force. In the tactical area there is heavy emphasis on buying up, for example, in our tactical air forces. The procurement rate has been inefficient and, as I noted, we are increasing that sizable. A near-term buy in the shipbuilding program are carriers and the two battleships.

In general, the R. & D. account addresses across the board basic research all the way through development to the point of procurement.

Senator STENNIS. You have made that clear now. When you say here that you are asking for $90 billion, that is not intentionally misleading but it sounds to me like you are saying you need that for basic research. But, you have made clear now that you are including in there the procurement money including the bombers.

Dr. WADE. Yes, sir.

Senator STENNIS. When you get off into that field, that has been a controversial matter, you might say, a judgment matter back and forth for years. There is money for the B-1 bomber already in the bill and, as I recall, the bill was pending on the Senate floor when the word came, you know, it was going to be discontinued and it took a vote to take the money out and we got into a scrap over that. So we look upon that as an old question and not research and development any more and we haven't been able to reach a decision yet about which bomber.

Dr. WADE. Yes, sir.

Senator Stennis. And then we just wait and wait, I mean Congress does. We need to get some final conclusion on that. So you help us separate these things in our mind.

TANK COMPARISONS

Then you talk about the comparisons in the tanks. Those of us who have been on the committee, we know the history about the tanks. We spent about 15 years I think on the Main Battle tank and then abandoned it somewhere about 1969 and then started on another one and it is just beginning to reach production now. Those of us who have the responsibility, we just can't understand why it takes so long. It is a practical matter to get down to a decision on the tank and then say, yes, and go to production.

Dr. Wade. I agree with that, sir.

Senator Stennis. I was chairman of the committee during those years, the authorization committee, and I proposed to do something about it but didn't get it done.

Dr. Wade. Yes, sir.

Senator Stennis. So where are we now? What are we going to do? What do you think about the tank now, the M-1 tank?

Dr. Wade. The M-1 tank is a superb tank, Senator Stennis.

Senator Stennis. I mean in production. You in fact are in production.

Dr. Wade. The program is on track. Your point is pertinent; namely, that we have had too many programs which moved along, half way through, and then we killed the programs. You know, our need is immediate. That is what you are saying and I certainly appreciate that.

Senator Stennis. Well, we have to have the tanks. There is no debate about that, as I understand. You really think though that we are going to move into production now on a large scale?

Dr. Wade. Yes, sir.

Senator Stennis. You haven't been denied any money anywhere along in there on the tanks. We have been for it.

Dr. Wade. The Congress has been fully supportive of the program. There were several questions in the sense of whether it really was ready over the last year to go into full production but the program is on track.

Senator Stennis. Well, I don't want to belabor that, but you don't have to use your statements here, to try to get the money out of us. Let's move on to where it is needed most.

Another thing, and I know you have rendered a fine service. I think there is no more important office in all of the Pentagon than the Under Secretary for Research and Engineering. You gentlemen haven't reached a decision and I am not pointing any finger at you, of course, but it is needed greatly. Put a man in here and let us pass on him and then you have got somebody to look to for responsibility in that field.

Dr. Wade. Yes, sir, I agree with that.

Senator Stennis. I can't emphasize that too much. We just have to have him.

Well, my time has expired. I just have another point or two here.

Senator **Stevens**. Go ahead.

BOMBER SELECTION

Senator **Stennis**. Well, about the bomber choice now, are you gentlemen really down to the point of giving us a choice about this bomber?

Dr. **Wade**. Yes, sir. The Secretary has a major review underway and he plans to come in with his position like in late June.

Senator **Stennis**. But you think they are really going to get to a choice?

Dr. **Wade**. We are going to move like mad, Mr. Chairman. We need that bomber and we need it soon.

CARGO PLANE STATUS

Senator **Stennis**. Well, we have been waiting for that. Also we have got the question here of a cargo plane. What about that? Do you plan to have that ready? We are the Appropriations Committee and I don't know when the bill will come up but it will go to markup soon.

Dr. **Wade**. As you indicated, Mr. Chairman, over the last 10 years we have had study after study which indicates that we need additional air lift. Now, we do have a major review for the Secretary. It is planned to have that finished sometime in the next several months and at that time we will come back to the Congress with the recommended position.

Senator **Stennis**. I doubt you are going to get that big money, Mr. Chairman, for these items before we know what item it is and the Department has made its decision. We just probably will not get it. I don't think the committee will recommend it until we know something more about it. These big projects, once you stamp "start" on them you have billions of dollars involved. I just wouldn't push this bill along, or try to, until you make those basic decisions.

Thank you.

Senator **Stevens**. Thank you, Senator.

Senator Andrews.

Senator **Andrews**. Thank you, Mr. Chairman.

BOMBER HARDWARE COSTS

Senator Stennis raised some important points. This is a $90 billion figure you are talking about for your shop. Does that include some prototypes of these new bombers or is this strictly research you are talking about?

Dr. **Wade**. You are talking about the $2.5 billion for the bomber program, Mr. Andrews?

Senator **Andrews**. In your budget, yes.

Dr. **Wade**. That is the start of the long-lead items. Of course, as far as the B-1 is concerned that is already a flying airplane. As far as the FB-111 B/C in the main the airplane is flying today.

Senator **Andrews**. But this $90 billion is not just paper and research, it also includes some hard pieces of metal that go to eventually become a bomber?

Dr. **WADE**. I think we have an appropriate balance in facing the question of our immediate needs. The program includes new hardware being brought in as fast as we can bring it into the force.

Senator **ANDREWS**. And you are paying for some of that hardware in the present budget?

Dr. **WADE**. Yes, sir.

Senator **ANDREWS**. How much of this budget is hardware and how much of it is still on paper?

Dr. **WADE**. The procurement part as I indicated earlier for the 1982 program comes to $68 billion versus $21 billion for R&D. So that comes to about a 3 to 1 ratio.

ABM DEFENSE OF M-X MISSILE

Senator **ANDREWS**. On page 11 of your testimony you talk of the M-X and you say "Active defense of M-X using ballistic missile defense appears to provide a cost-effective option in the face of substantial increases in the Soviet ICBM." When you talk about ballistic missile defense are you talking about the ABM concept?

Dr. **WADE**. The ABM concept.

Senator **ANDREWS**. And you say cost-effective. Now, I went along with the concept on the House side of shutting down that ABM site because it wasn't cost effective. The SALT treaty limited it to 100 missiles and the Soviets could throw a hundred missiles at it and boom. It was more cost effective to maintain the offensive missiles than for us to maintain the defensive missiles.

Is your cost effectiveness now based on the idea that we could have an ABM concept with more than a hundred defensive missiles?

Dr. **WADE**. There is no question, sir. The Grand Forks hundred interceptor and radar deployment was not effective in the sense of being able to do the job against the then Soviet threat.

Senator **ANDREWS**. In other words, it had to be 400, 500, 600, 700 or 800 at least.

Dr. **WADE**. At least that over-all. The only value of such a concept, if you are looking at the Safeguard system is to give you operational experience in the sense of deploying hardware in the area where you potentially would be deploying and get some experience in the operational area.

But as far as what I am talking about here, there is the possibility of looking at, as part of for example an MPS system, an overlay of an ABM defense that can provide you heavy leverage in the sense of the high number of RV's that would be attacking the ICBM deployment.

For example, if you have three RV's attacking three targets, and I put up one interceptor missile that can cover all three targets, the attacker doesn't know which ICBM target the interceptor missile basically is defending. So you get like a 3 to 1 leverage in this context.

For example, in the M-X system adding additional shelters in combination with an ABM system can multiply the leverage for the dollar cost more effectively than by just simply adding shelters.

Senator **ANDREWS**. But you are also preassuming that you are going to be able to go beyond 100 missiles.

Dr. **WADE**. There is no question about that.

OPTIONS IN ABM USE

Senator **Andrews**. Does this mean that we are going to junk the SALT Treaty which limits our ABM site to 100 missiles?

Dr. **Wade**. There are two options here. Option No. 1 would be a program that wouldn't be realizable, or deployable, for at least 8 years. If SALT fails in reference to how the Soviets downstream respond to our total missile program, then of course you have the option to deploy a system of that kind.

No. 2, in reference to the evaluation of the ABM technology we have under development right now, if we find downstream—the next few years—that the leverage would be high and available through BMD defense in the sense of viably protecting M-X, we then would have the option of going back to the Soviet Union, for example, as part of the 5-year ABM treaty review, and renegotiate the numbers of defensive missiles that are allowed under SALT.

Senator **Andrews**. Of course, you are saying that it appears to be more cost effective.

Dr. **Wade**. Yes, sir, "appears" is a good word here.

Senator **Andrews**. Is this a laser-type operation or is it the same type thing you employed in Safeguard essentially?

Dr. **Wade**. Well, Safeguard was a much older based technology then we have today. The big difference in ABM today, than 10 years ago, is that in effect we can put a 7700 computer on the front end of a defensive missile. It is the advent of this technology, for example, the new microelectronics, that really has given us high confidence that we can intercept missiles, and with high confidence.

About 10 years ago the confidence wasn't nearly what it is today. We can state with firm conviction that we can do the job in having an interceptor missile go out, even into space, and destroy an ICBM coming in.

Senator **Andrews**. But having built the Safeguard system and interfaced those operating components that gave you the experience to move to where you are today.

Dr. **Wade**. Yes, sir, you could still today deploy a limited system and use the ground there to employ new hardware to obtain needed experience with the newer radar and interceptor missiles. It is one option that I think is worth while looking at.

Senator **Andrews**. Do you think you may well move up and still use some of those installations?

Dr. **Wade**. Not the old ones. We are talking about new hardware.

Senator **Andrews**. So it would take a whole new installation.

Dr. **Wade**. With the exception of the PAR radar.

Senator **Andrews**. It is there and it is being maintained and could be part of a new ABM system because it is up to date technologically.

Dr. **Wade**. Yes, sir.

Senator **Andrews**. Thank you, Mr. Chairman.

Senator **Stevens**. Thank you.

Senator Rudman.

Senator **Rudman**. Mr. Chairman, I would yield back to Senator Stennis as he has another meeting to get to if he has another question.

Senator **Stennis**. I have decided to skip the meeting. Thank you very much.

Senator **Rudman**. Dr. Wade, how long have you been with this agency?

Dr. **Wade**. OSD?

Senator **Rudman**. Yes.

Dr. **Wade**. About 10 to 12 years.

ELF SYSTEM

Senator **Rudman**. Well, good. I want to ask you a question but I didn't want to ask you a question that in some way related to experiences that went on before you were there. I want to go back to March 1977. The purpose of my question is to try to see just how some of these things have tracked after they have been brought up at committee hearings and have been matters of importance and then been supplanted by other matters of importance.

I am talking about the ELF system. I assume that we can talk about the ELF system in open hearing.

Dr. **Wade**. To a certain extent I can.

Senator **Rudman**. Well, I will ask my question which does not contain any classified data and then you may not want to answer it in public. I want to go back to March 1977. In a letter from the CNO at that time, Admiral Hollaway, I wish to read an excerpt of that letter to the Secretary of Defense.

He said at that time:

> I assure you that the need for an ELF communications system is real and urgent, that it works and that there is no adequate alternative for communicating with our submarines without having to put an antenna near the surface and run the danger of detection and new technology is rapidly increasing the danger. To keep our submarines safe we have to keep them deep and their antennas away from the surface. To keep the country safe against the threat of nuclear attack we have to assure the safety of the submarine force.

There are a number of people who are close to the submarine force who I have discussed this with and it is a matter of great concern. Obviously that part of the Triad concept is not very good at all if we can't communicate with them or if it becomes too vulnerable.

DEPLOYMENT OF ELF SYSTEM

The 1981 bill contains a provision requiring a plan for deployment of that system. It was supposed to be approved by the President and submitted to Congress on April 1, 1981. I have two questions.

No. 1, what is the near-term feasibility of deploying the ELF knowing of the environmental objections and the problems you have had with it?

No. 2, is it on time?

Dr. **Wade**. Mr. Rudman, I want you to know one thing. Although I have been in OSD for 10 years I am just coming back into R.D. & A. for this new assignment. The last 4 years I have been responsible primarily for our nuclear weaponry.

Senator **Rudman**. Well, if for some reason you can't answer the question accurately here I would like to have an answer supplied.

Dr. **Wade**. Well, let me give you my best answer and then I can add to it in the record. First of all, the need for ELF is certainly there. As new technology comes on line downstream in the sense of the Soviets getting better and better in ASW, the ELF system allows the submarines to remain deep. I think we all understand that and appreciate the importance of staying deep.

Now, as to why there was a delay over the last 4 years, I wasn't a part of that decision process but I believe the system now is on track. We will have the document to the Congress on or about April 1 as requested. I don't believe that there is any problem in seeing the deployment of the ELF system, as planned for the Midwest.

I think the American people now recognize the seriousness of the Soviet threat, the fact that our weapons are becoming more vulnerable both in a technological sense and a forced deployment sense.

It has been my personal judgment that as long as the ELF system is needed, it is simply a question of how we go about getting the job done.

Senator **Rudman**. Thank you.

Senator **Stevens**. Thank you.

I am a little confused as to why you are going under the Advanced Research Projects Agency and your whole shop in terms of research, development, and acquisition. So much of the request is dedicated to things like bringing out the battleships. How did those battleships get into your budget? What has that got to do with research?

Dr. **Wade**. It doesn't in regard to the research account.

Mr. Chairman, it does in the account for procurement.

HARDWARE ACQUISITION

Senator **Stevens**. You have all the acquisition now for hardware in your budget?

Dr. **Wade**. Yes, sir.

Senator **Stevens**. There is not going to be any in any other budget that comes before us?

Dr. **Wade**. We are presenting today the R. & D. and acquisition program across the board. You will have in the near future the services come in to testify for their program, but I am providing to you the DOD budget across the board.

Senator **Stevens**. All the aircraft that we are going to acquire are in this budget?

Dr. **Wade**. Yes, sir. For fiscal year 1982.

Senator **Stevens**. Let me reflect what my good friend, Senator Stennis, says. We have a decision coming and we talked to the Secretary the other day about the M-X. We apparently have another one coming now on the question of the bomber.

Senator **Stennis**. Excuse me, and the cargo plane also.

MODERNIZATION OF BOMBER FORCE

Senator **Stevens**. And the cargo plane, the C-X. Those are all big dollar items. Apparently from what I understand, you want $2.4 billion here to support the development of any candidate to modernize the aging bomber force.

You know, we have some people who are devotees of the old B-1 and others that want the B-1 variant and others want the FB-111, and I happen to be one of those. It seems to me that it is going to be awfully hard to get that money and let you make that decision. That is one of our problems.

The Senator from North Dakota talks about that in terms of the ABM, too. This gentleman called me back as I got off the plane from flying all night into Dallas and I came back. We had won the ABM vote by one vote.

Do you remember that, Senator Stennis?

Senator STENNIS. Yes.

Dr. WADE. I was there, sir.

Senator STEVENS. I flew out all night and flew back all day and just barely made the vote. And what for? They closed the issue the day it was opened. Do you think we are going to let you make that decision again?

Dr. WADE. Sir, I think you appreciate, as we do, the need for a new bomber.

Senator STEVENS. You made the decision on the ABM and then you closed it as soon as you built it. Now how do we know you won't shut down the B-1 if you decide to use the B-1 and it becomes obsolete by the time you get to production?

You know, I think really what we ought to do since we have you gentlemen here, if there is no objection, I would like to go into laser. You just skipped over laser. I think that would require us to close the hearing.

Dr. WADE. Yes, sir.

Senator STEVENS. If there is no objection, I move that we close the hearing to discuss the laser options that may be available to this committee.

Senator ANDREWS. When I got into that, my 5 minutes ran out. [Laughter.]

Senator STENNIS. Mr. Chairman, before we do that, it seems to me like you have made it clear on the record for these gentlemen and all the others that come later. You don't feel that we can handle this bill with these vast sums for these new weapons until the decision is made which weapon it is going to be, you know, which bomber is it going to be and which cargo plane is it going to be.

Dr. WADE. Yes, sir, Mr. Chairman.

Senator STEVENS. Well, I would make one change to that. If we decide that we have to have a defense bill to get it done before the end of the fiscal year, I would think at the very least we would pull out the development money related to any decision that has been made and give you the money to go to development. That is what happened to you in the B-1, I want to remind you, and that is what happened to you in the fall of 1976 when Senator Proxmire put that amendment on and said you couldn't spend anything but development money until you made the decision and by that time the Congress changed its mind. You could have had the money in the fall of 1976.

Senator ANDREWS. Well, Mr. Chairman, what you are pointing out is so important. Your flight back to cast that one vote for the ABM certainly agreed with mine because I was for it.

Senator **Stevens**. I know that.

COST EFFECTIVENESS OF MISSILE SYSTEM

Senator **Andrews**. The ABM was a more humane way of killing other missiles rather than just mass annihilation of other people. It made sense. The only thing is somebody forgot to look at the treaty agreement under the SALT agreement. And after you got the thing made, being limited to a hundred missiles meant you had to shut it down because it wasn't cost effective.

Dr. **Wade**. That is right.

Senator **Andrews**. But you didn't tell the Congress ahead of time that it wouldn't be cost effective if built because of this hundred missile limitation.

Dr. **Wade**. Well, you know, the original plan was for much more than just one site.

Senator **Andrews**. And much more than a hundred missiles per site.

Dr. **Wade**. And much more than a hundred missiles per site.

Senator **Andrews**. But when you got pared down you lost your cost effectiveness. What the Senator from Alaska is saying and the Senator from Mississippi and certainly from my standpoint is if we do this on the B-1 and if we do this on some laser thing and if we do something else we want to make darn sure we are not running afoul of some agreement that the State Department is negotiating that negates what you do and what we do with American taxpayer dollars.

Dr. **Wade**. What I tried to indicate in my statement is that we have learned a little about arms control negotiations over the last 10 years. One thing we have learned is that the negotiations have to be supportive of our programs rather than the other way around. I think we have learned that, and hopefully will for the future.

Senator **Stevens**. Not just our generation. Go down to Fort Jefferson at the end of the Keys sometime and look at a great fort, a perimeter defense of the United States, solid brick, two or three walls and the only thing they forgot was that technology might catch up with them. It caught up with them and they never even finished the fort. Now, that is the ABM of that period of time and we just don't want to be responsible for another one.

I will repeat my move that we go into executive session and look into the laser problem.

[Whereupon, at 10:25 a.m., the subcommittee recessed the open meeting to go into executive session.]

Executive Session

The subcommittee convened in executive session at 10:25 a.m, in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, Andrews, Kasten, Rudman, and Stennis.

LASER SYSTEM DEVELOPMENT

Senator **Stevens**. We will go back on the record.

Gentlemen, with your consent, I would like to lead off and we will just have this be questions here.

I would like to know why it is not possible for us to skip some of these generations and go to the laser systems and be ahead of the Russians for a change. Is that possible and where are we?

Dr. **Fossum**. I would like to take a stab at answering that.

Senator **Stevens**. All right, sir.

Dr. **Fossum**. Within DARPA we have a threefold program ultimately aiming toward the use of high-energy laser systems or possibly, and I emphasize possibly, particle beam weapon systems in an ABM system. I am not really waffling that question, but these are very, very high technology issues.

If I were to see a way to get there from here, a prudent approach to the problem would be simply to have a problem as we have it now of R. & D. aiming toward the reduction of risk in the laser devise itself in the large mirror or bean expanders or antennas, so to speak, and in the fire control system. Those technologies are the most stressing technologies we have to approach. That in fact is our program.

FUNDING FOR LASER DEVELOPMENT

Senator **Stevens**. Have you been cut any moneys that you requested in the laser area?

Dr. **Fossum**. Yes, sir. We requested on the basis of a study that has been done a wedge for more money in 1981, 1982, and 1983.

Senator **Stevens**. I won't ask for it now, but could you give the committee if it is secure or arrange to find some way to get it to Mr. Bonner or Mr. Rhodes, and we will share it with the other members of the committee. What would that money have achieved?

Dr. **Fossum**. The wedge was in there to accomplish an acceleration of the existing program. The existing program is a step-wise approach to, if it is technically feasible, [deleted].

If we were to step toward that——

Senator **Stevens**. A space oriented [deleted].

Dr. **Fossum**. In space, yes, sir. The objective of the program would be to [deleted].

Senator **Stevens**. Senator Stennis, do you have any questions about this laser?

Senator **Stennis**. I believe not. Thank you.

Senator **Stevens**. Senator Andrews.

Senator **Andrews**. The thing that I get back to is that Dr. Wade is proposing in his testimony some type of an [deleted] on the line concept prior to the development of this laser. Would that [deleted].

Dr. **Wade**. Well, first of all, the [deleted] concept I am talking about is really near-term, in hand, technology, and in the main it is proven except for questions associated with system engineering. We were addressing here the possible utility of [deleted] systems being deployed in the [deleted].

Now what Dr. Fossum is talking about as far as lasers are concerned would be technology potentially available [deleted]. So we are talking about two different time periods.

Now, if this technology pays off, and I don't think we are near to being able to say that with high confidence, it is obvious that the two can't be gelled together, over the near time period.

Senator **Andrews**. But the near-term one you feel is necessary to [deleted].

Dr. **Wade**. The near-term [deleted] program would give us options for the [deleted]. I personally believe that this technology is far enough along for us now to be serious about it.

Senator **Stevens**. That is land-based laser, though, isn't it?

Dr. **Wade**. No, [deleted].

Dr. **Fossum**. It is not laser.

Senator **Andrews**. Would you [deleted] or would you [deleted].

Dr. **Wade**. I am talking about options available for a variety of tasks that we need to look at, not only [deleted].

Senator **Andrews**. Would it be cost effective with [deleted] or would it be only cost effective with [deleted] where you have a variable input?

Dr. **Wade**. I believe the best answer we can give now is that you need a mix of a [deleted]. But we are still just beginning to allocate the needed additional money to get serious and address the hard questions in our [deleted].

My concern over the past 8 years, has been that we haven't been sufficiently serious about [deleted]. The technology has been coming along, but just barely, and there are lots of important questions that now can be addressed in the sense of having the additional money that is required.

Senator **Stevens**. Senator Rudman.

PARTICLE BEAM TECHNOLOGY

Senator **Rudman**. I have one question on the particle beam technoglogy. It is my understanding that one of your major problems, a technical problem still to come, is to generate energy. Right now technology, even that which is state of the art and slightly beyond, it takes a large amount of that technology in terms of weight and in terms of mass, to get that in space with sufficient quantities to generate the kind of particle beam or laser that you need, and more particle beam than I think laser. Is that correct?

Dr. **Wade**. Yes, sir.

Senator **Rudman**. If that is correct then, and it may be a question of combining modules as your technology develops, don't we kind of have to think in the back of our minds toward Skylab and other transporters that are in another program altogether which might become extraordinarily valuable to us [deleted] down the line to [deleted].

Dr. **Fossum**. Most of our estimates at this time indicate that we will have [deleted]. But I comment on the space-based particle beam, which is a neutral beam weapon system and differs from the endoatmospheric program where our major investment is at this time in that it is very early.

We are in the process of looking at lightweight accelerators and the technology that will enable us to, should we make that decision, to go out in space with that.

DEPARTMENT LIAISON WITH NASA

Senator **Rudman**. Is there any informal or formal liaison between your agency and NASA. Isn't that something you ought to be very actively pursuing?

Dr. **Fossum**. In fact, we do have liaison both formal and informal with NASA. The early part of the neutral beam program that we are in now has not been an issue of discussion with NASA because in our view it is quite far out.

In the scientific programs and engineering programs where they have a joint interest, large optics, for example, and in aeronautics, we are in constant communication and at least once a year I go over and talk with the Administrator and his Deputy and explain what our programs are. We use lots of NASA facilities, especially in the aero program. We have technology based programs for large structures in space which is one of their pushes and our material science research does support that type of activity.

Senator **Rudman**. Mr. Chairman, just one more minute. The reason I raise this point is, you know, I would be willing to bet that the Russian military who are working in their particle beam systems are working in conjunction with their space people without the bureaucracy that we have.

Senator **Stevens**. Senator, I think somewhere along the line when we get to the briefing out at the Pentagon we can perhaps answer some of those questions for you.

Senator **Rudman**. I would like that.

Senator **Stevens**. Senator Stennis.

Senator **Stennis**. Mr. Chairman, I will submit some questions for Dr. Fossum to answer for the record.

Senator **Stevens**. Let me state for you, gentlemen, that [deleted]. There will have to be some renegotiations [deleted].

Dr. **Wade**. [Deleted] if you develop a new system of that kind, you have to go back into consultations. It doesn't say you have to reach agreement.

BATTLESHIP CONVERSION

Senator **Stevens**. I would like to ask while we are in executive session, if it is agreeable, that we shift to these two battleships.

Senator Tower implied to me in a converation that the *New Jersey* and *Iowa* were to be converted and at least there was some research that would indicate that they might be useful for something other than being sitting ducks on the Persian Gulf.

Now, that shows my bias toward that concept, perhaps, because I don't know why we are bringing out those two old battlewagons, and I really am serious. Is there something, and I want to ask just a shotgun question, but is there something that we don't know about the *New Jersey* and the *Iowa* that is related to your program and some sort of research and development associated with the cruise missile or something?

Dr. **Wade**. Well, in the sense of placing many cruise missiles on those two older platforms, that is certainly an approach which we are going to look at very seriously.

Senator **Stevens**. Is that a proposal that is before us though for this money? You have indicated that the additional resources will go toward reactivation of the battleships *New Jersey* and *Iowa* which will be armed with modern weapons.

Is there any security item associated with the reactivation of the *New Jersey* and the *Iowa* that this committee hasn't been informed of?

Dr. **Wade**. I don't believe so, sir. I believe the Navy will be over to talk to you for these details.

Senator **Andrews**. Well, those darn things are the slowest sitting duck targets.

Dr. **Fossum**. I have an opinion if I could express it.

Senator **Stevens**. Sure. This is the place to express opinions. I am beginning to believe that there is something there I don't know about.

SHIP SURVIVABILITY

Dr. **Fossum**. I have a comment. One of the key issues in ships today, in my view, is the survivability of those ships under a severe attack. Now, there are various ways of achieving survivability, but one of them is to have a heavily armored ship. The armor on the *Iowa, New Jersey, Wisconsin, Missouri,* and so forth is of the order of 16 inches of rolled homogeneous armor. The engineering spaces and the magazines in those ships are well protected by not the same level but a comparable level of armor to make the ships very, very survivable. So in my view, the operation of a ship in the Persian Gulf region demands survivability.

One way of achieving it is through these ships there. The ships are excellent ships. They are not slow ships. Assuming that we can in fact use the engineering plants that were on the ships when they were in commission. The ships can achieve, with all boilers lit off, speeds of the order of 30 knots which is comparable to steaming in a task force or battle group today. They are not slow ships at all.

I believe the key issue in the ships, however, is their survivability.

Senator **Stevens**. The Russians have got a submarine now that can go [deleted] knots. How secure is a battleship that can go 30?

Dr. **Fossum**. The Alpha submarine, which you are referring to, is a [deleted] submarine. The use of this ship in [deleted] the threat will probably not be the Alpha itself as the ship could operate in the [deleted].

Senator **Stevens**. But those battleships still have less speed than the offensive submarines that would be deployed against them.

Dr. **Fossum**. Less speed than the Alpha. I don't know the answers.

Dr. **Wade**. But a battleship will be part of a battle group, and within the battle group you will have a screen of ships, to also include aircraft, like the P-3's. So the the survivability issue can't be looked at, Mr. Chairman, by just looking at one platform.

Senator **Stevens**. I understand.

Dr. **Wade**. Senator, may I ask Mr. Hardison to join the table. He is from our Tactical Warfare Office and has been overseeing this program.

Senator **Rudman**. Mr. Chairman, could I ask a question following on your question.

Senator **Stevens**. Yes, sir. I think we ought to use this time, gentlemen, for any questions concerning the security aspects of the presentation that the two doctors have made to us.

Mr. Hardison, yes, sir.

Mr. **Hardison**. I think I have, really on the particular point of the battleship, nothing to add. It looks as if we do need more ships. the firepower that is on those ships is what we need. The cost of bringing those back into service looks as if it would be small compared to starting afresh building new frigates which would be far less capable. The plan is to put on the ships the modern antiaircraft weapons and modern surface target attack weapons and use the investment we already have in the basic ship.

Senator **Andrews**. But that electrical wiring and all the other circuitry is in top flight shape and it hasn't degraded?

Mr. **Hardison**. I don't think I could answer yes to that question.

Senator **Stevens**. We can get that from the Navy I am sure when they come.

SOVIET NAVAL SURFACE SHIPS

Senator **Rudman**. I just wanted to come back to your question on survivability. If you look at the information, on the Soviet naval forces. They are going to large numbers of very fast light small surface vessels. All PGM equipped with multiple PGM's. It would seem to me that targets the size of these battleships would be enormously vulnerable to multiple attacks by PGM's. Is that accurate?

Dr. **Fossum**. It is my belief that the warship is in fact susceptible to attack but the key issue is: Can they survive that type of attack? Examples during World War II show that a well constructed ship heavily armored with a very good damage control, that is flooding effect control, will survive.

I would estimate that one of the most survivable, if not the most survivable ships in the world today is one of these ships. It is not only the armor, the inability to penetrate to the propulsion and magazines and the fire control system and the weapons, but it is the fact of flooding effect and the control of flooding in the event the ship is hit, which it will be hit.

There are numerous examples historically of ships with good armor protection and good damage control being able to handle this.

Senator **Rudman**. Of course the difference today, doctor, is that multiple-launched Soviet PGM's from 15 or 20 light fast surface vessels descending on something like one of these battleships, the amount of explosive power even with conventional explosives, is enormous compared to what they would have been hit with in World War II even with combination submarine and surface attacks.

Dr. **Fossum**. During World War II, Mr. Rudman, the danger to the battleship was from armor piercing projectiles. It was not from high-capacity rounds. Most of these types of weapons that you were describing are modifications of the high-capacity projectile. They do not have the kinetic energy to penetrate the armor. The buoyancy of the ship is based upon its ability to make sure no flooding occurs within the armored box.

These weapons you describe, in my view, will have a devastating effect if the warship comes under attack, but not so devastating that the survivability sense of the ship is in doubt.

Senator **Rudman**. They may survive, but I am not sure how well they would be able to carry out their mission.

SHIP SURVIVABILITY AGAINST AIR ATTACK

Senator **Stevens**. Let me get back to Senator Stennis. Maybe we ought to float one of those things out there and turn loose a few F-15's and see if it would survive. I have a feeling that Mig-25's could wipe out one of those battleships. The last time I compared a P-40 which I thought was one of the most powerful weapons in our day, back in World War II days, it would take more than 20 of them to make one F-15. And if you turn 20 P-40's loose on a battleship I had the impression back in the old days that it would have done a hell of a lot of damage. I think one or two Zeros did at a time or two.

Now, if we are going to say this thing is going to be available in any threat, well, just suppose they turned the Migs loose on a battleship out there. I just don't think it would survive.

Dr. **Wade**. Well, if you say you are turning Migs loose on just the battleship by itself, it might indeed be in trouble, but it will be in and part of a battle group. The SM-2 defensive missile system can force the price up to the order of 50 airplanes, all coming in at one time. So it is a question of a battle groups overall effectiveness.

Senator **Stevens**. Senator Stennis, do you have any questions?

Senator **Stennis**. Mr. Chairman, you are right on the mark on this thing as I see it. The Navy will have to justify your points. Maybe right here is where the record ought to show us an answer to your question.

Senator **Stevens**. If we have nothing more in secure, we ought to be back into public session.

STEALTH PROGRAM

Senator **Andrews**. Let me get to one other thing while we are secure. When we are talking about the B-1 and picking and choosing between two versions of the B-1 and the FB-111, where does Stealth fit in this? Is this as close as some people would have us believe? Is this 20 years down the path?

Dr. **Wade**. When you talk about the B-1 or the B-1 variant you are really talking about an IOC that could be available in about 5 years.

With reference to the Stealth program and its application [deleted]. So one of the questions for the Congress is the requirement for a near-term response to the Soviet threat and then also the far term, or do you want to take a chance and make the jump just to the far term. That certainly is one of the key issues that is being studied by the new Secretary of Defense.

Senator **Andrews**. You are talking about the look-down radar or look-down missile as being the death knell of the B-52?

Dr. **Wade**. Not per se the death knell of the B-52. If the B-52 tries to penetrate, it is in trouble. There is no question about that over the decade of the eighties.

Senator **Andrews**. Well, the whole concept of the B-52 penetrating was getting down on the deck and coming in and that no longer can be done, as I understand it.

Dr. **Wade**. There are two parts. One is the ability for the old airplane to get off the ground from a nuclear attack. The second part is, once it gets to its launch zone for cruise missiles, can it also follow up and penetrate into the Soviet Union.

My perception for the eighties is the B-52 is in trouble. There is a need for a new follow-on bomber. I also hate to have to go through more studies, as you suggest, Mr. Chairman. The problem we, as a group, have is a new team coming in. I think it is appropriate to take some time to go through the many variants that people are interested in for a new bomber. I think it is quite clear we need a new bomber. In the sense of your committee looking at holding up the moneys, I hope that doesn't delay the process once we get going because the need is really here.

SUPERIORITY OF B-1 OVER B-52

Senator **Andrews**. When you talk about getting off the ground would the B-1 have a better opportunity of getting off the ground than the B-52?

Dr. **Wade**. There is no question about that. It was designed to do that.

Senator **Andrews**. Why?

Dr. **Wade**. Faster flyout times. It is also a harder airplane to nuclear effects. The whole spectrum of nuclear effects on an airplane were taken into account with the design of that airplane.

Senator **Stevens**. It was designed to start construction in 1977 and we are talking now about starting construction about 1987 as I understand it.

Dr. **Wade**. No, sir. If the decision were made to go to that variant, the construction would start well before then.

Senator **Andrews**. Have you upgraded it since the design.

Dr. **Wade**. There will be pieces that have been upgraded on the airplane, I am sure. I don't have all the details.

FB-111

Senator **Stevens**. Well, we hope to get into that option. As I said, I am quite interested in that FB-111. We could be putting money into the next generation rather than putting money into what we should have started in 1976, in my opinion.

Senator **Andrews**. Would the FB-111 be any faster coming onboard than the B-1?

Dr. **Wade**. Yes; but the other question is what is the cost per weapon delivered.

Senator **Stevens**. That is the problem.

Senator **Andrews**. Which is more cost effective?

Senator **Stevens**. If it means before the year 2000 we have got a more modern penetrating manned bomber than they have, that is a cost, too, and we are ahead. The question is can we get ahead and not behind.

Dr. **Wade**. I will have to review those numbers to be clear.

Senator **Andrews**. You don't know between the B-1 and the FB-111.

[The information follows:]

We can build a more modern aircraft. The B-1 Variant, now being proposed as an example of current technology aircraft, is certainly more modern than their in-production Backfire Bomber. The difference being that our much more capable B-1 bomber is not in production; whereas, their Backfire has been in production for some time.

As far as the intent of the second part of the question, "can we get ahead?", this implies a relative comparison of penetration capabilities vice Soviet and U.S. bombers. Future bombers such as those candidates like the FB-111B/C, the B-1 Variant, or the advanced technology aircraft should be capable of penetrating Soviet defenses for the foreseeable future.

CONCLUSION OF CLASSIFIED TESTIMONY

Senator **Stevens**. Gentlemen, do we have any more secure requests, any requests for secure information?

[No response.]

Senator **Stevens**. Let me ask you. Is there anything else in here that is brand new that we ought to know about that is secure?

Dr. **Wade**. I don't believe so, sir.

Senator **Stevens**. I don't see anything that wasn't presented to the committee last year. Am I wrong about that?

Dr. **Wade**. Well, there are new programs and accelerated programs.

Senator **Stevens**. I am talking about a new secure weaponry that you are going to use this money to take beyond research. Is there anything in here that is new that wasn't in there last year?

Dr. **Wade**. I don't believe so.

Senator **Andrews**. Have you got anything on the MX that wasn't in here last year, any new concepts?

Dr. **Wade**. No.

Senator **Andrews**. So, you have no new information on the MX?

Dr. **Wade**. There is nothing different.

Senator **Stevens**. Again I want to make a last request if there are any other requests for secure information?

[No response.]

If not, I think we ought to go back into a public session and keep these secret sessions to a limit. We are going to get most of our briefings on secret matters and other classified matters over at the Pentagon under the agreement that we have.

All right, have you got anything else on the MX to answer Senator Andrews' question?

Dr. **Wade**. No, sir.

[Whereupon, at 10:50 a.m., the executive session concluded and the subcommittee reconvened in public session.]

Open Session

REACTIVATION OF BATTLESHIPS

Senator **Stevens**. We are back in open session.

How much money is in this budget to reactivate the battleships?

Mr. **Hardinson**. Mr. Chairman, I can answer the question. In the fiscal year 1982 amendment, and there was none in the original submission, there is $2 million R. & D. and $158 million in the procurement account for the *New Jersey* and $2 million R. & D. and $88 million for the *Iowa*. The *Iowa* will be staged a bit behind the *New Jersey* to take advantage of what lessons we have learned.

Senator **Stevens**. All right. Well, there is $2.4 billion here. How much will be the total amount that is estimated to be required to reactive the *New Jersey* and the *Iowa*?

Mr. **Hardinson**. The total amount to reactivate would be $160 million and $90 million is $250 million.

Senator **Stevens**. How much is in this one for 1982?

Mr. **Hardinson**. That is the figure I just gave you, sir.

Senator **Stevens**. Is that the total amount for this reactivation?

Mr. **Hardinson**. I believe that is correct, and I will of course check the numbers. That is the fiscal year 1982 amendment and I believe there was no money in the original Carter budget submit for those two.

CARRIER "ORISKANY"

Senator **Stevens**. OK. Now, what about the carrier, the *Oriskany*?

Mr. **Hardinson**. The *Oriskany*, there is in the fiscal year 1981 supplement a request for $7 million R. & D. and $139 million for procurement funds. In the fiscal year 1982 a total of $8 million R. & D. and $364 million for the procurement.

Senator **Stevens**. We will ask the Navy about the details of what the outgoing year costs of maintaining this would be. What are we talking about in terms of R. & D. for all three of those R. & D. moneys? What is involved there?

Mr. **Hardinson**. For R. & D. moneys for all three there is a total of $12 million fiscal year 1982.

Senator **Stevens**. What are you going to do with it and what is the money for?

Mr. **Hardinson**. That starts the redesign effort for incorporation of the more modern weapon suit doing the design work for the rewiring, as was mentioned by the Senator, and work of that class to take the ship out of mothballs and bring it back into service and do some design work for incorporating the more modern weapons.

BATTLESHIPS IN MONTHBALLS

Senator **Stevens**. How many battleships do we have in mothballs, do you know?

Mr. **Hardinson**. I do not know.

Dr. **Fossum**. There are four total, the *New Jersey, Iowa, Wisconsin,* and *Missouri* that are afloat. I don't know what the status of the *Missouri* is. It is a national monument.

Senator **Stennis**. What is your manpower cost and all? You don't have that included and I wouldn't expect you to have it.

Senator **Stevens**. The Navy will get to that.

Senator **Stennis**. Yes, they will get it.

Senator **Stevens**. I just want to know how many more we have in the closet that might come out if we agree to this?

Senator **Stennis**. Well, I understand they are in an amazing state of preservation, you know.

Senator **Stevens**. Yes, I understand that.

Senator **Stennis**. With the long barrelled guns and everything.

Senator **Stevens**. All right. Well, we will get the details from the Navy.

Now, this matter, we have the MX and the bomber in a state where decisions are still to be made.

Senator **Stennis**. And the cargo plane.

Dr. **Wade**. The C–X.

Senator **Stevens**. That is another. Now, is there anything else that a decision has not been made as to what the money would be spent on that we are asking money for?

Dr. **Wade**. I believe those are the three major studies.

Senator **Stevens**. The major items.

Dr. **Wade**. Yes, sir.

Senator **Stevens**. We still have the tank question, but there is not really much question there.

Dr. **Wade**. That is in production.

ELF TIMEFRAME

We have this question with ELF, but as far as big monies are concerned that is not in the same category you are talking about here.

Senator **Stevens**. If I understood the Senator the other day, the opposition to that system is dwindling and it might be time to get it out.

Dr. **Wade**. That is right, sir.

Senator **Stevens**. What is the time frame now on ELF?

Dr. **Wade**. If everything goes on schedule, then the IOC would be on the order of like 1985 or 1986. I have asked to see how fast we can move the IOC up because that is also, in my personal judgment, a little slow.

Senator **Stevens**. Who made the decisions on this increased procurement for the aircraft? Was that the Air Force and it has been put into yours, or do you make those decisions and tell the Air Force what they are going to get?

Dr. **Wade**. No. That was input from the services worked with the OSD staffs, and then reviewed by the Secretary as to the most efficient buy and also with regard near-term needs for our force structure. So there was a corporate level review within the Department of Defense.

INCREASED PRODUCTION OF F-15 AND F-16

Senator **Stevens**. Well, when the Air Force comes I hope someone is going to be able to tell us how we can increase that F-15 production and the F-16 production that much and meet the demands from Saudi Arabia and Israel and our other partners along the line. It just seems to me that that is going to be a boom and bust economy rather than a gradual buildup in terms of that production and I hope someone is going to be able to give us figures on that.

My impression, for what it is worth, is if you increase the demand that much you are liable to force the price of the F-15's up rather than turn them down. [Laughter.]

Mr. **Hardinson**. Mr. Chairman, I will stand corrected when the Air Force comes, but I believe that this will not be an increase relative to earlier production levels but will be rather a slowing up of the reduced production levels. We are not producing F-15's now at as high a rate as we were at an earlier time. I believe the same is true of the F-16.

Senator **Stevens**. Well, I did not know that. I would like to see those schedules of what was originally projected.

Mr. **Hardinson**. The fiscal year 1982 funded delivery period as opposed to today's production.

OVERDEVELOPMENT OF MISSILE SYSTEMS

Senator **Stennis**. Mr. Chairman, let me raise one point here. You gentlemen said you were approaching the position where you like the industrial capacity in certain fields, including these subcontractors. Now, I just have an idea that we have as many missiles, so many missiles, so many different kinds, that when one service gets a new missile the other services have got to have one, too. With all these multitudes of different kinds, it runs the cost up for everyone and there is just a limit to what we can afford.

What is your answer to that. You don't have to agree now.

Dr. **Wade**. Mr. Chairman, I believe the point you are making is a good point in the sense that although the requirements are firmly stated by the services and responses are made there, too, that we haven't to date taken a sufficient total look in the sense of how many programs we start and how many we finish and how many we cancel half-way through.

This is one of the major new thrusts that both Dr. DeLauer and I plan to undertake within R. & E.—to try to get a handle on how many programs we can afford in an aggregate sense. Rather than continue to build all new systems as our deployed systems get older, to try to improve upon our systems in the field, through product improvements, and try to save money in that sense.

Your concern is correct. The system has done a fairly good job in the past, but with costs going up the way they are we can't continue the old way.

Senator **Stennis**. Well, that is an encouraging answer and I hope the chairman had a chance to hear.

Senator **Stevens**. I did.

Senator **Stennis**. We are pleased with what you have said.

Dr. **Wade**. Yes, sir.

RESEARCH AREAS CUT

Senator **STEVENS**. I would particularly like to know what areas that we have with any research that has been cut out.

Senator **STENNIS**. Yes.

Senator **STEVENS**. There was one question there that I don't think we have identified. I really think for a time there when we were looking for places to cut, and we always cut the research, and that should be immune.

Senator **STENNIS**. Basic research you are talking about now.

Dr. **WADE**. And applied research, both of them. Yes, sir.

RESEARCH ACTIVITY ON U.S./ROK FORCES

Senator **STEVENS**. Dr. Fossum, I noticed this Korean upgrade that you mentioned in your additional request. Now, I take it that is just on the procurement side. Is there any research activity or development activity associated with those United States and ROK forces requests from CINCPAC?

Dr. **FOSSUM**. If I could just briefly summarize the status of that.

Senator **STEVENS**. Yes.

Dr. **FOSSUM**. Commander in Chief Pacific, Admiral Long, did ask DARPA to help him in evaluating the status of forces in Korea with respect to the technological level and weapons level for those forces vis-a-vis a growing threat in North Korea. We did that evaluation and at the same time the objective was to evaluate near-term and intermediate-term technology which would be useful in that theater.

We did that and came up with a set of problems or technologies which would be very useful to General Wickam in Korea.

The money that is in the supplemental which is in the additional request which is $4 million in 1981 and $42 million in 1982 above what we had submitted before and is listed in this over $700 million we are asking for, the DARPA budget is primarily to take a set of existing technologies developed in DARPA, some technologies that are not in DARPA and to demonstrate those technologies for application in their intermediate term in Korea.

DARPA INTERMEDIATE TERM PROJECTS

I would like to list those for you if you are interested in what they are.

Senator **STEVENS**. Were any of the requests cut?

Dr. **FOSSUM**. No, sir; it was not cut at all.

Senator **STEVENS**. It is fully funded?

Dr. **FOSSUM**. Yes, sir.

The first was a simple indication warning system. Money was budgeted for that.

The second was the netted radar system which was developed under DARPA and is a ground based tactical surveillance system. It has been tested at Fort Sill and that now needs to be militarized and put into a demonstration situation in Korea. There is no new technology in that. It is simply a problem of making it, so to speak, soldier-proof.

The CELT system is a radio frequency precise emitter location and is related to the indication and warning system.

There is a real time electro-optics system that flies on a U-2.

There is a classified program referred to as Teal Rain. There is secure and survivable communications demonstrations in terms of the DARPA packet radio tht is now being demonstrated in the 18th Airborne Corps at Fort Bragg. The interest is to demonstrate it and see its utility in the Korean situation.

There is finally the hard structure munition to enable us to attack targets that are very hard, either they are deep in the ground or they are heavily covered with concrete.

Those are the intermediate-term projects which the money is in DARPA. Of those the packet radio, Teal Rain, CELT, and the netted radar are DARPA developed technology.

Target Analysis and Planning System (TAPS), the EO system in that case and the hard structure munition are not, but we will fund out of DARPA the development and the demonstration of those particular programs.

Senator STEVENS. Did DARPA have anything to do with the development of this new radar system that is going to be put in my State that the Air Force announced?

Dr. FOSSUM. I don't know. Within the DARPA budget as far back as I can remember there has been no specific funds spent on the installation of a radar in an operation. The technology base of the high frequency radar, the OTH-B came out of the DARPA program. The technology base for phased array radars used even in some of the discussion we had earlier in the Safeguard system and so forth did come out of the DARPA technology base, but our investments are almost exlusively in the technology base and in this case the demonstrations.

SUBMITTED QUESTIONS

Senator STEVENS. Gentlemen, we have a series of questions that have been submitted by the chairman of the committee that we would like to have answered for the record. We have similar questions that I would like to submit for the record and we will inform you if any other Senator has any. I believe Senator Stennis already indicated he had some.

Senator STENNIS. Yes. I have submitted those already.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

QUESTIONS SUBMITTED BY SENATOR STEVENS

FY 82 Research and Development

Senator Stevens: Mr. Secretary, the press release of March 4, 1981, indicated that there will be an increase of $5.2 billion for Research and Development for fiscal year 1982 over fiscal year 1981. How much of this increase is estimated for inflation and how much for real growth?

Dr. Wade: Discounting the contingency for pay raise which is included in the $5.2 billion which would reduce this growth figure to $4.6 billion, $1.4 billion is a result of inflation computations and $3.2 billion represent real growth.

Senator Stevens: What was the inflation factor given for the development of the budget for Research and Development?

Dr. Wade: Inflation factor used in the development of the R&D budget was 8.0% in FY 81 and 7.7% in FY 82.

Senator Stevens: How is the $21.3 billion requested for Research and Development divided in the various categories for Research and Development:

Dr. Wade: FY 82 Research and Development Categories

	($ Millions)	%
Research	722.7	3.4
Exploratory Development	2,372.6	11.1
Advanced Development	3,627.3	17.0
Engineering Development	8,475.4	39.8
Management & Support	2,098.7	9.8
Operational Systems Development	4,024.3	18.9
Total	21,321.0	100.0

Senator Stevens: How much of the funds requested will be for research to be conducted by universities? Please provide the committee with a list of the universities that received funds in fiscal years 1979, 1980, and 1981, as well as a list of those universities expected to receive funds in fiscal year 1982.

Dr. Wade: Awards to universities are made largely in response to unsolicited proposals sent by faculty members. Therefore, we do not have available data for FY 82, and data for FY 81 are still in the process of being compiled since the awards have not all been made. The total funding for R&D at universities was $410 million in FY 79; $474 million in FY 80; and it is estimated to be $547 million in FY 81, and $678 million in FY 82. Of this total, 42 percent is for basic research, the rest is for applied research and development.

The list of universities receiving funds from DoD in FY 79 and FY 80 are included in the attachments.

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
A I A RESEARCH CORP		48 *
WASHINGTON	DC	48
ACADEMY FOR CONTEMPORARY PROBLEMS		55 *
WASHINGTON	DC	55
ACADEMY INTERSCIENCE METHODOLOGY		178 *
CHICAGO	ILLINOIS	178
ACADEMY OF APPLIED SCIENCE INC		75 *
RALEIGH	NCAR	75
ACCELERATOR LABORATORY		48 *
ALBANY	NEW YORK	48
ADVANCED INTL STUDIES INSTITUTE		274 *
WASHINGTON	DC	274
AEROSPACE CORP		121,887 *
EL SEGUNDO	CALIFORNIA	121,887
AKRON UNIVERSITY OF		98 *
AKRON	OHIO	98
ALABAMA CIVIL PREPAREDNESS		14 *
VARIOUS CITIES	ALABAMA	14
ALABAMA UNIVERSITY OF		785 *
BIRMINGHAM	ALABAMA	441
HUNTSVILLE	ALABAMA	117
UNIVERSITY	ALABAMA	227
ALASKA UNIVERSITY OF		9,328 *
FAIRBANKS CITY	ALASKA	9,328
ALBERTA UNIVERSITY		12 *
HANOVER	NH	12
AMERICAN COUNCIL EDUCATION		52 *
WASHINGTON	DC	52
AMERICAN DENTAL ASSOCIATION		20 *
CHICAGO	ILLINOIS	20
AMERICAN FOUNDATION BIOLOGICAL		609 *
ROCKVILLE	MARYLAND	609
AMERICAN INSTITUTE BIOLOGICAL		88 *
ARLINGTON	VIRGINIA	88
AMERICAN INSTITUTE FOR RESEARCH		446 *
WASHINGTON	DC	180
BEDFORD	MASS	191
PALO ALTO	CALIFORNIA	75
AMERICAN NATIONAL RED CROSS		125 *
WASHINGTON	DC	125
AMERICAN UNIVERSITY		166 *
WASHINGTON	DC	166
AMERICAN WATER WORKS ASSOC RSCH		31 *
DENVER	COLORADO	31
AMHERST COLLEGE		32 *
AMHERST	MASS	32
ANALYTIC SERVICES INC		5,886 *
ARLINGTON	VIRGINIA	4,950
WILLOW GROVE	PA	249
WRIGHT PATTERS	OHIO	687
APPLIED INSTITUTE OF MATHEMATICS		15 *
CORAL GABLES	FLORIDA	15
ARCTIC INSTITUTE OF NORTH AMERICA		28 *
ARLINGTON	VIRGINIA	28
ARIZONA STATE UNIVERSITY		195 *
TEMPE	ARIZONA	195
ARIZONA UNIVERSITY OF		3,881 *
IGLOO PARKS 16	ALASKA	47
TUCSON	ARIZONA	3,834
ARKANSAS UNIVERSITY OF		62 *
FAYETTEVILLE	ARKANSAS	62
ATLANTIC COUNCIL		22 *
WASHINGTON	DC	22
AUBURN UNIVERSITY		862 *
AUBURN	ALABAMA	862
BATTELLE MEMORIAL INSTITUTE		13,224 *
	GERMANY	108
WASHINGTON	DC	11
ABERDEEN PROV	MARYLAND	288
ALEXANDRIA	VIRGINIA	13
ARLINGTON	VIRGINIA	18
ATLANTA	GEORGIA	75
COMMERCE CITY	COLORADO	55
BEAUMONT	TEXAS	14
EGLIN AFB	FLORIDA	27
DOVER	NEW JERSEY	282
WHITE SANDS MS	NEW MEXICO	164
FALLS CHURCH	VIRGINIA	48
FORT MONMOUTH	NEW JERSEY	133
DURHAM	NCAR	319
FORT BELVOIR	VIRGINIA	21
FORT EUSTIS	VIRGINIA	181
FORT MONROE	VIRGINIA	51
NATICK	MASS	26
COLUMBUS	OHIO	9,476
HUNTSVILLE	ALABAMA	271
RICHLAND	WASHINGTON	979
WALTHAM	MASS	21
REDSTONE ARSEN	ALABAMA	414
WATERTOWN	MASS	27
RALEIGH	NCAR	14
RESEARCH TRIAN	NCAR	18
SAN DIEGO	CALIFORNIA	11
ROCK ISLAND	ILLINOIS	164
ST LOUIS	MISSOURI	20
WRIGHT PATTERS	OHIO	122
BAYLOR UNIVERSITY		251 *
HOUSTON	TEXAS	251
BETH ISRAEL HOSPITAL		55 *
NEW YORK	NEW YORK	55
BLOOD RESEARCH INSTITUTE INC		54 *
BOSTON	MASS	54
BOSTON COLLEGE		2,035 *
CHESTNUT HILL	MASS	999
HANSCOM AFB	MASS	484
NEWTON	MASS	320
WESTON	MASS	232
BOSTON UNIVERSITY		1,342 *
BOSTON	MASS	1,342

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DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
BOWLING GREEN STATE UNIVERSITY		45 *
BOWLING GREEN	OHIO	45
BRANDEIS UNIVERSITY		22 *
WALTHAM	MASS	22
BRIGHAM YOUNG UNIVERSITY		134 *
PROVO	UTAH	134
BROOKINGS INSTITUTION		178 *
WASHINGTON	DC	178
BROWN UNIVERSITY		634 *
PROVIDENCE	RI	634
CALIFORNIA ACADEMY OF SCIENCE		75 *
SAN FRANCISCO	CALIFORNIA	75
CALIFORNIA INSTITUTE OF TECHNOLOGY		3,309 *
PASADENA	CALIFORNIA	3,309
CALIFORNIA STATE COLLEGE		65 *
HAYWARD	CALIFORNIA	65
CALIFORNIA STATE OF		179 *
SACRAMENTO	CALIFORNIA	179
CALIFORNIA STATE UNIVERSITY		93 *
LONG BEACH	CALIFORNIA	15
NORTHRIDGE	CALIFORNIA	56
SACRAMENTO	CALIFORNIA	22
CALIFORNIA UNIVERSITY OF		24,159 *
BERKELEY	CALIFORNIA	6,842
MOUNT LEMMON	ARIZONA	13
DAVIS	CALIFORNIA	248
IRVINE	CALIFORNIA	920
LA JOLLA	CALIFORNIA	6,848
LOS ANGELES	CALIFORNIA	2,648
RIVERSIDE	CALIFORNIA	159
SAN DIEGO	CALIFORNIA	2,436
SAN FRANCISCO	CALIFORNIA	267
SANTA BARBARA	CALIFORNIA	604
SANTA CRUZ	CALIFORNIA	248
SEPULVEDA	CALIFORNIA	45
WRIGHT PATTERS	OHIO	2,888
CAPITOL RADIO ENGINEERING INST INC		1,526 *
SILVER SPRING	MARYLAND	1,526
CARNEGIE INSTITUTION OF WASHINGTON		68 *
WASHINGTON	DC	68
CARNEGIE MELLON UNIVERSITY		4,536 *
PITTSBURGH	PA	4,536
CASE WESTERN RESERVE UNIVERSITY		991 *
CLEVELAND	OHIO	991
CATHOLIC UNIVERSITY OF AMERICA		781 *
WASHINGTON	DC	781
CENTER FOR CREATIVE LEADERSHIP		11 *
GREENSBORO	NCAR	11
CENTRAL MICHIGAN UNIVERSITY		69 *
MOUNT PLEASANT	MICHIGAN	69
CHARLES STARK DRAPER LABS INC		65,049 *
CAMBRIDGE	MASS	65,049
CHICAGO UNIVERSITY		527 *
CHICAGO	ILLINOIS	527
CHILDRENS CANCER RESEARCH		13 *
BOSTON	MASS	13
CINCINNATI UNIVERSITY OF		822 *
CINCINNATI	OHIO	427
WRIGHT PATTERS	OHIO	395
CITY OF HOPE MEDICAL CENTER		28 *
DUARTE	CALIFORNIA	28
CITY UNIV OF NEW YORK RSCH FOUND		138 *
FLUSHING	NEW YORK	138
CITY UNIVERSITY OF NEW YORK		206 *
NEW YORK	NEW YORK	206
CLAREMONT COLLEGES & UNIV CENTER		20 *
CLAREMONT	CALIFORNIA	20
CLARK UNIVERSITY		16 *
WORCESTER	MASS	16
CLARKSON COLLEGE OF TECHNOLOGY		635 *
POTSDAM	NEW YORK	635
CLEMSON UNIVERSITY		227 *
CLEMSON	SCAR	227
CLEVELAND CLINIC		83 *
CLEVELAND	OHIO	83
COLORADO SCHOOL OF MINES		144 *
GOLDEN	COLORADO	144
COLORADO STATE UNIVERSITY		846 *
FORT COLLINS	COLORADO	846
COLORADO UNIVERSITY		1,071 *
BOULDER	COLORADO	957
DENVER	COLORADO	114
COLUMBIA UNIVERSITY		4,052 *
NEW YORK	NEW YORK	3,912
PALISADES	NEW YORK	140
CONFERENCE BOARD OF MATH SCIENCES		18 *
WASHINGTON	DC	18
CONNECTICUT UNIVERSITY OF		459 *
FARMINGTON	CONN	80
STORRS	CONN	379
COORDINATING RESEARCH COUNCIL INC		148 *
NEW YORK	NEW YORK	148
CORNELL UNIVERSITY		2,858 *
ITHACA	NEW YORK	2,651
NEW YORK	NEW YORK	207
DARTMOUTH COLLEGE		112 *
HANOVER	NH	112
DAYTON UNIVERSITY OF		13,564 *
KIRTLAND AFB	NEW MEXICO	3,039
EDWARDS AFB	CALIFORNIA	155
DAYTON	OHIO	5,728
WRIGHT PATTERS	OHIO	4,642

* = MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
DREXEL UNIVERSITY		429 *
PHILADELPHIA	PA	429
DUKE UNIVERSITY		788 *
DURHAM	NCAR	788
EMMANUEL COLLEGE		725 *
BOSTON	MASS	55
LEXINGTON	MASS	670
EMORY UNIVERSITY		44 *
ATLANTA	GEORGIA	44
ENGINEERS COUNCIL FOR PROFESS DEV		74 *
NEW YORK	NEW YORK	74
ENVIRONMENTAL RSCH INST OF MICH		5,991 *
ANN ARBOR	MICHIGAN	5,033
YPSILANTI	MICHIGAN	958
FACTORY MUTUAL RESEARCH CORP		65 *
NORWOOD	MASS	65
FAIRLEIGH DICKINSON UNIVERSITY		60 *
HACKENSACK	NEW JERSEY	60
FAR WEST LAB FOR EDUC RES & DEV		228 *
BERKELEY	CALIFORNIA	128
SAN FRANCISCO	CALIFORNIA	88
FLORIDA DEPT OF HEALTH & REHAB SVC		30 *
TALLAHASSEE	FLORIDA	30
FLORIDA STATE UNIVERSITY		922 *
GAINESVILLE	FLORIDA	24
TALLAHASSEE	FLORIDA	898
FLORIDA TECHNOLOGICAL UNIVERSITY		791 *
ORLANDO	FLORIDA	791
FLORIDA UNIVERSITY		946 *
GAINESVILLE	FLORIDA	946
FRANKLIN INSTITUTE OF PENNSYLVANIA		38 *
PHILADELPHIA	PA	38
FRANKLIN INSTITUTE RESEARCH LAB		54 *
PHILADELPHIA	PA	54
GEOPHYSICAL INSTITUTE OF ALASKA		822 *
FAIRBANKS CITY	ALASKA	822
GEORGE WASHINGTON UNIVERSITY		1,445 *
WASHINGTON	DC	1,445
GEORGETOWN UNIVERSITY		586 *
WASHINGTON	DC	586
GEORGIA INSTITUTE TECH		5,127 *
ATLANTA	GEORGIA	5,127
GEORGIA STATE COLLEGE		124-*
ATLANTA	GEORGIA	124-

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
GERMANTOWN LABORATORIES INC		116 *
ELVERSON	PA	20
PHILADELPHIA	PA	96
GILLETTE RESEARCH INSTITUTE INC		33 *
ROCKVILLE	MARYLAND	33
GORGAS MEMORIAL INSTITUTE OF TROPI		187 *
WASHINGTON	DC	187
GULF SOUTH RESEARCH INSTITUTE		15 *
NEW ORLEANS	LOUISIANA	15
HAHNEMANN MEDICAL COLLEGE & HOSPIT		99 *
PHILADELPHIA	PA	99
HARBOR GENERAL HOSPITAL		82 *
TORRANCE	CALIFORNIA	82
HARVARD UNIVERSITY		1,421 *
CAMBRIDGE	MASS	1,421
HAWAII UNIVERSITY OF		2,726 *
HONOLULU CITY	HAWAII	2,686
PEARL HARBOR	HAWAII	40
HOUSTON UNIVERSITY OF		517 *
HOUSTON	TEXAS	517
HOWARD UNIVERSITY		26 *
WASHINGTON	DC	26
HUDSON INSTITUTE		564 *
CROTON ON HUDS	NEW YORK	564
HUMAN RESOURCES RESEARCH ORGN		1,427 *
	GERMANY	558
ALEXANDRIA	VIRGINIA	792
MONTEREY	CALIFORNIA	78
ILLINOIS INSTITUTE TECHNOLOGY		23,442 *
ANNAPOLIS	MARYLAND	17,456
CHICAGO	ILLINOIS	4,647
DAYTON	OHIO	19
GRIFFISS AFB	NEW YORK	277
ROME	NEW YORK	974
WRIGHT PATTERS	OHIO	72
ILLINOIS UNIVERSITY OF		3,727 *
CHAMPAIGN	ILLINOIS	179
CHICAGO	ILLINOIS	811
URBANA	ILLINOIS	2,737
INDIANA UNIVERSITY		320 *
BLOOMINGTON	INDIANA	295
INDIANAPOLIS	INDIANA	25
INSTITUTE FOR ADVANCED STUDY		18 *
PRINCETON	NEW JERSEY	18
INSTITUTE FOR BEHAVIORAL RESEARCH		99 *
SALT LAKE CITY	UTAH	99
INSTITUTE FOR DEFENSE ANALYSIS		15,777 *
ARLINGTON	VIRGINIA	15,777

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EDUCATIONAL AND NON-PROFIT INSTITUTIONS RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
INSTITUTE FOR RESEARCH INC		15 *
STATE COLLEGE	PA	15
INSTITUTE FOR RESEARCH STUDIES		15 *
ATHENS	OHIO	15
INSTITUTE FOREIGN POLICY ANALYSIS		150 *
CAMBRIDGE	MASS	150
INSTITUTE OF BEHAVIORAL SCIENCES		54 *
HONOLULU CITY	HAWAII	54
INSTITUTE OF COMPARATIVE CULT STUD		63 *
WASHINGTON	DC	63
INSTITUTE OF GAS TECHNOLOGY		98 *
CHICAGO	ILLINOIS	98
INSTITUTE OF MEDICAL SCIENCES		118 *
SAN FRANCISCO	CALIFORNIA	118
INTERNATIONAL ASSN FIRE CHIEFS INC		68 *
WASHINGTON	DC	68
INTERNATIONAL CITY MGT ASSOCIATION		50 *
WASHINGTON	DC	50
IOWA STATE UNIV OF SCIENCE & TECH		134 *
AMES	IOWA	134
IOWA UNIVERSITY OF		1,232 *
AMES	IOWA	182
IOWA CITY	IOWA	1,050
JACKSON COUNTY DISASTER EMERG SVC		57 *
PASCAGOULA	MISS	57
JEFFERSON MEDICAL COLLEGE		42 *
PHILADELPHIA	PA	42
JOHN CARROLL UNIVERSITY		78 *
CLEVELAND	OHIO	78
JOHNS HOPKINS UNIVERSITY		155,881 *
BALTIMORE	MARYLAND	782
SCAGGSVILLE	MARYLAND	155,099
KANSAS STATE UNIVERSITY		124 *
MANHATTAN	KANSAS	124
KANSAS UNIVERSITY OF		519 *
EL DORADO	KANSAS	59
KANSAS CITY	KANSAS	179
LAWRENCE	KANSAS	281
KENT STATE UNIVERSITY		26 *
KENT	OHIO	26
KENTUCKY RESEARCH FOUNDATION		318 *
LEXINGTON	KENTUCKY	318
KENYON COLLEGE		15 *
GAMBIER	OHIO	15
LA JOLLA INSTITUTE		296 *
LA JOLLA	CALIFORNIA	296
LEHIGH UNIVERSITY		870 *
BETHLEHEM	PA	870

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
LENOX HILL HOSPITAL		21-*
NEW YORK	NEW YORK	21-
LOGISTICS MANAGEMENT INSTITUTE		1,988 *
WASHINGTON	DC	1,988
LOUISIANA STATE UNIVERSITY OF		983 *
BATON ROUGE	LOUISIANA	910
NEW ORLEANS	LOUISIANA	73
LOUISVILLE UNIVERSITY OF		235 *
LOUISVILLE	KENTUCKY	235
LOWELL STATE COLLEGE		128 *
LOWELL	MASS	128
LOWELL TECHNOLOGICAL INSTITUTE		259 *
LOWELL	MASS	259
LOYOLA UNIVERSITY		4-*
CHICAGO	ILLINOIS	19
MAYWOOD	ILLINOIS	23-
MAINE UNIVERSITY OF		99 *
ORONO	MAINE	99
MARYLAND UNIVERSITY OF		2,330 *
BALTIMORE	MARYLAND	455
COLLEGE PARK	MARYLAND	1,875
MASONIC MEDICAL RSCH LABORATORY		48 *
UTICA	NEW YORK	48
MASSACHUSETTS GENERAL HOSPITAL		11 *
BOSTON	MASS	11
MASSACHUSETTS INSTITUTE TECHNOLOGY		123,724 *
BLACKSTONE	MASS	50
CAMBRIDGE	MASS	11,946
LEXINGTON	MASS	111,728
MASSACHUSETTS UNIVERSITY OF		1,004 *
AMHERST	MASS	843
WORCESTER	MASS	161
MAYO FOUNDATION		28 *
ROCHESTER	MINNESOTA	28
MEDICAL COLLEGE OF SOUTH CAROLINA		18 *
CHARLESTON	SCAR	18
MEDICAL COLLEGE OF WISCONSIN		168 *
MILWAUKEE	WISCONSIN	168
MEMPHIS STATE UNIVERSITY		28 *
MEMPHIS	TENNESSEE	28
MIAMI UNIVERSITY		256 *
OXFORD	OHIO	136
WRIGHT PATTERS	OHIO	120
MIAMI UNIVERSITY OF		2,677 *
CORAL GABLES	FLORIDA	2,287
GAINESVILLE	FLORIDA	182
MIAMI	FLORIDA	208
MICHIGAN STATE UNIVERSITY		467 *
EAST LANSING	MICHIGAN	467
MICHIGAN TECHNOLOGICAL UNIVERSITY		486 *
HOUGHTON	MICHIGAN	486

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DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
MICHIGAN UNIVERSITY OF		2,244 *
ANN ARBOR	MICHIGAN	2,244
MIDWEST RESEARCH INSTITUTE		720 *
KANSAS CITY	MISSOURI	720
MILITARY OPERATIONS RESEARCH SOC		96 *
ALEXANDRIA	VIRGINIA	96
MINNESOTA UNIVERSITY OF		974 *
MINNEAPOLIS	MINNESOTA	504
ST PAUL	MINNESOTA	470
MISSISSIPPI STATE UNIVERSITY		58 *
STATE COLLEGE	MISS	58
MISSISSIPPI UNIVERSITY OF		50 *
UNIVERSITY	MISS	50
MISSOURI UNIVERSITY OF		749 *
COLUMBIA	MISSOURI	418
KANSAS CITY	MISSOURI	22
ROLLA	MISSOURI	309
MITRE CORP		84,795 *
BEDFORD	MASS	84,570
MCLEAN	VIRGINIA	225
MONMOUTH COLLEGE		11 *
WEST LONG BRAN	NEW JERSEY	11
MONTANA STATE UNIVERSITY		203 *
BOZEMAN	MONTANA	203
MONTEFIORE HOSPITAL MEDICAL CENTER		74 *
NEW YORK	NEW YORK	74
MOUNT SINAI HOSPITAL		145 *
NEW YORK	NEW YORK	145
MOUNT SINAI HOSPITAL OF CLEVELAND		42-*
CLEVELAND	OHIO	42-
MULTNOMAH COUNTY OFC OF EMERG SVC		78 *
PORTLAND	OREGON	78
NATIONAL ACADEMY OF PUBLIC ADMIN		78 *
WASHINGTON	DC	78
NATIONAL CNCL SOVIET E EUROPE RSCH		1,129 *
CAMBRIDGE	MASS	1,129
NATIONAL COUNCIL ON RADN PROT MEAS		15 *
WASHINGTON	DC	15
NATIONAL GOVERNORS CONFERENCE		379 *
WASHINGTON	DC	379
NEBRASKA UNIVERSITY OF		129 *
LINCOLN	NEBRASKA	28
OMAHA	NEBRASKA	101
NEVADA UNIVERSITY OF		609 *
RENO	NEVADA	609
NEW ENGLAND MEDICAL CENTER HOSPITL		99 *
BOSTON	MASS	99
NEW ENGLAND MUNICIPAL CENTER		99 *
DURHAM	NH	99

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
NEW HAMPSHIRE UNIVERSITY OF		634 *
DURHAM	NH	634
NEW JERSEY INSTITUTE OF TECHNOLOGY		37 *
NEWARK	NEW JERSEY	37
NEW MEXICO INSTITUTE MINING & TECH		1,719 *
SOCORRO	NEW MEXICO	1,719
NEW MEXICO STATE UNIVERSITY		6,226 *
LAS CRUCES	NEW MEXICO	5,406
YUMA	ARIZONA	70
WHITE SANDS MR	NEW MEXICO	750
NEW MEXICO UNIVERSITY OF		5,428 *
ALBUQUERQUE	NEW MEXICO	1,931
KIRTLAND AFB	NEW MEXICO	3,497
NEW ORLEANS UNIVERSITY OF		21 *
NEW ORLEANS	LOUISIANA	21
NEW YORK BLOOD CENTER INC		73 *
NEW YORK	NEW YORK	73
NEW YORK POLYTECHNIC INSTITUTE		1,735 *
BROOKLYN	NEW YORK	1,568
FARMINGDALE	NEW YORK	39
NEW YORK	NEW YORK	128
NEW YORK STATE UNIV RESEARCH FOUND		1,428 *
ALBANY	NEW YORK	1,277
STONY BROOK	NEW YORK	151
NEW YORK STATE UNIVERSITY OF		255 *
ALBANY	NEW YORK	178
NEW YORK	NEW YORK	77
NEW YORK UNIVERSITY		876 *
NEW YORK	NEW YORK	876
NORTH CAROLINA CIVIL PREPAREDNESS		109 *
VARIOUS CITIES	NCAR	109
NORTH CAROLINA STATE UNIVERSITY		472 *
CHAPEL HILL	NCAR	59
RALEIGH	NCAR	413
NORTH CAROLINA UNIVERSITY OF		607 *
CHAPEL HILL	NCAR	536
CHARLOTTE	NCAR	12
WILMINGTON	NCAR	59
NORTH CENTRAL ASSOC OF COLLEGES		81 *
VARIOUS	DOMESTIC	81
NORTH TEXAS STATE UNIVERSITY		58 *
DENTON	TEXAS	58
NORTHEASTERN RESEARCH FOUNDATION		56 *
BOOTHBAY HARBO	MAINE	56
NORTHEASTERN UNIVERSITY		958 *
BOSTON	MASS	958
NORTHERN ARIZONA UNIVERSITY		96 *
FLAGSTAFF	ARIZONA	96
NORTHERN ILLINOIS UNIVERSITY		28 *
DE KALB	ILLINOIS	28

- * MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART 1 - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
NORTHWEST REGIONAL EDUCATIONAL LAB		60 *
PORTLAND	OREGON	60
NORTHWESTERN UNIVERSITY		881 *
EVANSTON	ILLINOIS	881
NOTRE DAME UNIVERSITY OF		482 *
NOTRE DAME	INDIANA	482
NOVA UNIVERSITY OF ADVANCED TECH		127 *
FORT LAUDERDALE	FLORIDA	52
MELBOURNE	FLORIDA	75
OAKLAND UNIVERSITY		145 *
ROCHESTER	MICHIGAN	145
OHIO STATE UNIV RESEARCH FOUNDATION		2,228 *
COLUMBUS	OHIO	2,228
OHIO STATE UNIVERSITY THE		636 *
LOGAN	UTAH	21
COLUMBUS	OHIO	615
OHIO UNIVERSITY		225 *
ATHENS	OHIO	225
OHIO WESLEYAN UNIVERSITY		18 *
DELAWARE	OHIO	18
OKLAHOMA CIVIL PREPAREDNESS		25 *
VARIOUS CITIES	OKLAHOMA	25
OKLAHOMA STATE UNIVERSITY OF		1,770 *
EGLIN AFB	FLORIDA	289
STILLWATER	OKLAHOMA	1,481
OKLAHOMA UNIVERSITY OF		167 *
NORMAN	OKLAHOMA	167
OLD DOMINION UNIVERSITY RSCH FOUND		94 *
NORFOLK	VIRGINIA	94
OREGON GRADUATE CTR FOR STUDY RES		144 *
BEAVERTON	OREGON	144
OREGON STATE OF		60 *
CORVALLIS	OREGON	60
OREGON STATE UNIVERSITY		1,625 *
CORVALLIS	OREGON	1,625
OREGON UNIVERSITY OF		336 *
EUGENE	OREGON	184
PORTLAND	OREGON	152
PALISADES GEOPHYSICAL INSTITUTE		2,107 *
	BERMUDA	956
BLAUVELT	NEW YORK	656
MIAMI	FLORIDA	495
PALISADES INSTITUTE		712 *
NEW YORK	NEW YORK	712
PENNSYLVANIA COLLEGE OF OPTOMETRY		20 *
PHILADELPHIA	PA	20
PENNSYLVANIA COMMONWEALTH OF		20 *
HARRISBURG	PA	20
PENNSYLVANIA HOSPITAL CONTRIBUTORS		181 *
PHILADELPHIA	PA	181
PENNSYLVANIA STATE UNIVERSITY.		14,562 *
STATE COLLEGE	PA	1,105
UNIVERSITY PAR	PA	13,457
PENNSYLVANIA UNIVERSITY OF		3,132 *
PHILADELPHIA	PA	3,132
PETER BENT BRIGHAM HOSPITAL		267 *
BOSTON	MASS	267
PITTSBURGH UNIVERSITY OF		1,588 *
PITTSBURGH	PA	1,588
PORTLAND STATE UNIVERSITY		82 *
PORTLAND	OREGON	82
PRINCETON UNIVERSITY		1,068 *
PRINCETON	NEW JERSEY	1,068
PURDUE RESEARCH FOUNDATION		1,465 *
LAFAYETTE	INDIANA	200
WEST LAFAYETTE	INDIANA	1,265
PURDUE UNIVERSITY		68 *
LAFAYETTE	INDIANA	44
WEST LAFAYETTE	INDIANA	24
QUEENS HOSPITAL MEDICAL CENTER		85 *
HONOLULU CITY	HAWAII	85
RANCHO LOS AMIGOS HOSPITAL		20 *
DOWNEY	CALIFORNIA	20
RAND CORP		15,826 *
SANTA MONICA	CALIFORNIA	15,826
REGIS COLLEGE		335 *
WESTON	MASS	335
RENSSELAER POLYTECHNIC INSTITUTE		1,828 *
TROY	NEW YORK	1,828
RESEARCH FOUNDATION OF SUNY BUFFAL		84 *
BUFFALO	NEW YORK	84
RESEARCH TRIANGLE INSTITUTE		1,153 *
RESEARCH TRIAN	NCAR	1,153
RHODE ISLAND CIVIL PREPAREDNESS		52 *
VARIOUS CITIES	RI	52
RHODE ISLAND UNIVERSITY OF		1,156 *
KINGSTON	RI	1,156
RICE UNIVERSITY		274 *
HOUSTON	TEXAS	274
RIVERSIDE RESEARCH INSTITUTE		3,436 *
NEW YORK	NEW YORK	3,436
ROCHESTER UNIVERSITY OF		12,048 *
ARLINGTON	VIRGINIA	5,049
ROCHESTER	NEW YORK	6,999
ROCKEFELLER UNIVERSITY		281 *
NEW YORK	NEW YORK	281
RUSH PRESBYTERIAN ST LUKES MED CTR		128 *
CHICAGO	ILLINOIS	128

- * MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
RUTGERS UNIVERSITY		316 *
NEW BRUNSWICK	NEW JERSEY	296
PISCATAWAY	NEW JERSEY	20
S R I INTERNATIONAL		24,154 *
ARLINGTON	VIRGINIA	119
MENLO PARK	CALIFORNIA	23,737
SAN FRANCISCO	CALIFORNIA	298
SAINT JOSEPH COLLEGE MARYLAND		66 *
PHILADELPHIA	PA	66
SAINT JUDE CHILDRENS RSCH HOSPITAL		58 *
MEMPHIS	TENNESSEE	58
SAINT LOUIS UNIVERSITY		145 *
CAHOKIA	ILLINOIS	20
ST LOUIS	MISSOURI	125
SALK INSTITUTE THE		1,781 *
SWIFTWATER	PA	1,781
SAN DIEGO SOCIETY OF NATURAL HISTO		[illegible] *
SAN DIEGO	CALIFORNIA	42
SAN DIEGO STATE COLLEGE FOUNDATION		75 *
SAN DIEGO	CALIFORNIA	75
SAN JOSE STATE UNIVERSITY FOUND		201 *
LONG BEACH	CALIFORNIA	167
SAN JOSE	CALIFORNIA	34
SCRIPPS CLINIC RESEARCH		143 *
LA JOLLA	CALIFORNIA	143
SEATTLE UNIVERSITY		19 *
SEATTLE	WASHINGTON	19
SOCIETY OF AUTOMOTIVE ENGINEERS		48 *
WARRENDALE	PA	48
SOUTH ALABAMA UNIVERSITY OF		58 *
MOBILE	ALABAMA	58
SOUTH CAROLINA UNIVERSITY OF		946 *
CHARLESTON	SCAR	40
COLUMBIA	SCAR	906
SOUTH DAKOTA SCHOOL OF MINES TECH		25 *
RAPID CITY	SDAK	25
SOUTH FLORIDA UNIVERSITY OF		308 *
TAMPA	FLORIDA	308
SOUTHEASTERN CTR ELECT ENGR EDUC		1,305 *
AUBURN	ALABAMA	405
ORLANDO	FLORIDA	464
WRIGHT PATTERS	OHIO	436
SOUTHEASTERN MASS TECH INSTITUTE		97 *
DARTMOUTH	MASS	75
NORTH DARTMOUTH	MASS	22
SOUTHERN CALIFORNIA UNIVERSITY OF		11,872 *
LOS ANGELES	CALIFORNIA	11,864
MARINA DEL REY	CALIFORNIA	8
SOUTHERN ILLINOIS UNIVERSITY		55 *
EDWARDSVILLE	ILLINOIS	55
SOUTHERN METHODIST UNIVERSITY OF		328 *
DALLAS	TEXAS	328
SOUTHERN RESEARCH INSTITUTE		2,661 *
BIRMINGHAM	ALABAMA	2,661
SOUTHERN UNIVERSITY & A & M COL		30 *
BATON ROUGE	LOUISIANA	30
SOUTHWEST RESEARCH INSTITUTE		5,162 *
SAN ANTONIO	TEXAS	5,162
SPEECH COMMUNICATIONS RESEARCH LAB		178 *
LOS ANGELES	CALIFORNIA	40
SANTA BARBARA	CALIFORNIA	138
STANFORD UNIVERSITY		16,694 *
MENLO PARK	CALIFORNIA	49
STANFORD	CALIFORNIA	16,645
STEVENS INSTITUTE OF TECHNOLOGY		1,336 *
HOBOKEN	NEW JERSEY	1,336
SYRACUSE RESEARCH CORP		843 *
SYRACUSE	NEW YORK	843
SYRACUSE UNIVERSITY		2,065 *
ROME	NEW YORK	146
SYRACUSE	NEW YORK	1,919
SYRACUSE UNIVERSITY RESEARCH CORP		1,304 *
SYRACUSE	NEW YORK	1,304
SYSTEMS & EVALUATIONS IN EDUCATION		99 *
SANTA CRUZ	CALIFORNIA	99
TEMPLE UNIVERSITY		31 *
PHILADELPHIA	PA	31
TENNESSEE TECHNOLOGICAL UNIVERSITY		22 *
COOKEVILLE	TENNESSEE	22
TENNESSEE UNIVERSITY OF		1,093 *
KNOXVILLE	TENNESSEE	656
MEMPHIS	TENNESSEE	68
GOLETA	CALIFORNIA	33
TULLAHOMA	TENNESSEE	336
TEXAS A & M RESEARCH FOUNDATION		978 *
COLLEGE STATIO	TEXAS	978
TEXAS A & M UNIVERSITY		777 *
COLLEGE STATIO	TEXAS	777
TEXAS CHRISTIAN UNIVERSITY		168 *
FORT WORTH	TEXAS	168
TEXAS INSTITUTE FOR REHAB & RSCH		30 *
HOUSTON	TEXAS	30
TEXAS TECHNOLOGICAL COLLEGE		474 *
LUBBOCK	TEXAS	474
TEXAS UNIVERSITY OF		15,072 *
ARLINGTON	TEXAS	143
AUSTIN	TEXAS	14,116
FORT LAUDERDAL	FLORIDA	25
DALLAS	TEXAS	146
EL PASO	TEXAS	262
GALVESTON	TEXAS	291
HOUSTON	TEXAS	47
RICHARDSON	TEXAS	68

- = MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
TRINITY UNIVERSITY		40 *
SAN ANTONIO	TEXAS	40
TUFTS UNIVERSITY		225 *
BOSTON	MASS	52
MEDFORD	MASS	173
TULANE UNIVERSITY OF LOUISIANA		81 *
COVINGTON	LOUISIANA	50
NEW ORLEANS	LOUISIANA	31
TUSKEGEE INSTITUTE		41 *
TUSKEGEE	ALABAMA	41
UNDERSEA MEDICAL SOCIETY INC		129 *
BETHESDA	MARYLAND	129
UNITED STATES CIVIL DEFENSE COUNCL		80 *
PORTSMOUTH	VIRGINIA	80
UNIVERSITY CITY SCIENCE CENTER		67 *
PHILADELPHIA	PA	67
UNIVERSITY HOSPITAL INC		57 *
BOSTON	MASS	57
UTAH STATE UNIVERSITY		4,299 *
LOGAN	UTAH	4,299
UTAH UNIVERSITY OF		18,589 *
SALT LAKE CITY	UTAH	18,589
VANDERBILT UNIVERSITY		67 *
NASHVILLE	TENNESSEE	67
VERMONT UNIV OF & STATE AGRIC COLL		119 *
BURLINGTON	VERMONT	119
VIRGINIA COMMONWEALTH UNIVERSITY		256 *
RICHMOND	VIRGINIA	256
VIRGINIA MASON RESEARCH CENTER		37 *
SEATTLE	WASHINGTON	37
VIRGINIA MILITARY INSTITUTE		25 *
LEXINGTON	VIRGINIA	25
VIRGINIA POLYTECHNIC INSTITUTE		1,417 *
BLACKSBURG	VIRGINIA	1,417
VIRGINIA UNIVERSITY OF		729 *
CHARLOTTESVILL	VIRGINIA	729
WASHINGTON STATE UNIVERSITY		152 *
PULLMAN	WASHINGTON	152
WASHINGTON UNIVERSITY		278 *
ST LOUIS	MISSOURI	278
WASHINGTON UNIVERSITY OF		8,717 *
SEATTLE	WASHINGTON	8,701
ST LOUIS	MISSOURI	16
WAYNE STATE UNIVERSITY		751 *
DETROIT	MICHIGAN	751
WENTWORTH INSTITUTE		1,531 *
BOSTON	MASS	1,531
WEST FLORIDA UNIVERSITY OF		107 *
PENSACOLA	FLORIDA	107
WESTERN MICHIGAN UNIVERSITY		18 *
KALAMAZOO	MICHIGAN	18
WESTERN WASHINGTON STATE COLLEGE		160 *
BELLINGHAM	WASHINGTON	160
WILLIAM & MARY COLLEGE OF		64 *
WILLIAMSBURG	VIRGINIA	64
WISCONSIN UNIVERSITY OF		1,931 *
MADISON	WISCONSIN	1,867
MILWAUKEE	WISCONSIN	64
WISTAR INSTITUTE OF ANATOMY BIOLOY		48 *
PHILADELPHIA	PA	48
WITTENBERG UNIVERSITY		13 *
SPRINGFIELD	OHIO	13
WOODS HOLE OCEANOGRAPHIC INST		6,121 *
WOODS HOLE	MASS	6,121
WORCESTER POLYTECHNIC INSTITUTE		140 *
WORCESTER	MASS	140
WRIGHT STATE UNIVERSITY		347 *
DAYTON	OHIO	257
WRIGHT PATTERS	OHIO	90
WYOMING UNIVERSITY OF		216 *
LARAMIE	WYOMING	216
YALE UNIVERSITY		1,941 *
NEW HAVEN	CONN	1,941
		981,948

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DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART II - U.S. GOVERNMENT AGENCIES

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS	NAME OF CONTRACTOR AND LOCATION	THOUSANDS OF DOLLARS
NATIONAL ACADEMY OF SCIENCES		5,538 *		
WASHINGTON	DC	5,433		
WHITE SANDS MI	NEW MEXICO	105		
NATIONAL SCIENCE FOUNDATION		528 *		
WASHINGTON	DC	528		
SMITHSONIAN INSTITUTION		788 *		
WASHINGTON	DC	565		
CAMBRIDGE	MASS	223		
UNITED STATES COMMERCE DEPT		1,930 *		
WASHINGTON	DC	1,372		
BOULDER	COLORADO	441		
GAITHERSBURG	MARYLAND	69		
SEATTLE	WASHINGTON	12		
NORMAN	OKLAHOMA	36		
UNITED STATES ENERGY DEPT		921 *		
WASHINGTON	DC	25		
ALBUQUERQUE	NEW MEXICO	58		
OAK RIDGE	TENNESSEE	20		
LIVERMORE	CALIFORNIA	290		
OAKLAND	CALIFORNIA	528		
UNITED STATES JUSTICE DEPT		20 *		
WASHINGTON	DC	20		
UNITED STATES LABOR DEPT		58 *		
WASHINGTON	DC	58		
UNITED STATES NATL AERO SPACE AGY		2,858 *		
RIDGELEY	WVA	2,858		
UNITED STATES OFFICE OF MGT & BGET		155 *		
	JAPAN	155		
		11,952		

- = MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

EDUCATIONAL AND NON-PROFIT INSTITUTIONS RECEIVING MILITARY PRIME CONTRACTS OVER $10,000 FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1979

PART III - FOREIGN INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION	THOUSANDS OF DOLLARS	NAME OF CONTRACTOR AND LOCATION	THOUSANDS OF DOLLARS
BRISTOL UNIVERSITY OF	15 *		
UN KINGDOM	15		
CAMBRIDGE UNIVERSITY OF	15 *		
UN KINGDOM	15		
FULMER RESEARCH INSTITUTE	45 *		
UN KINGDOM	45		
HERIOT WATT UNIVERSITY	28 *		
UN KINGDOM	28		
ISRAEL GOVERNMENT MINISTRY DEFENSE	189 *		
ISRAEL	189		
LEEDS UNIVERSITY OF	13 *		
UN KINGDOM	13		
MANCHESTER UNIVERSITY	64 *		
UN KINGDOM	64		
MANILA OBSERVATORY	20 *		
PHILIPPINES	20		
MAYOR OF OLONGAPO OFFICE OF	11 *		
PHILIPPINES	11		
MCGILL UNIVERSITY	42 *		
CANADA	42		
NATIONAL TAIWAN UNIVERSITY MCSF	1,157 *		
FRCSA/TAI	1,157		
OULU UNIVERSITY OF	21 *		
FINLAND	21		
PARIS UNIVERSITY OF	51 *		
FRANCE	51		
ROYAL NORWEGIAN NAV MAT COMD	1,500 *		
NORWAY	1,500		
SOCIETE NATIONALE INDUSTRIELLE	185 *		
FRANCE	185		
UNITED KINGDOM MINISTRY OF DEFENCE	1,456 *		
UN KINGDOM	1,456		
UNIVERSIDAD NACIONAL DE TUCUMAN	15 *		
ARGENTINA	15		
	4,827		

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DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
ACADEMY INTERSCIENCE METHODOLOGY		288 *
CHICAGO	ILLINOIS	288
ADVANCED INTL STUDIES INSTITUTE		175 *
WASHINGTON	DC	175
AEROSPACE CORP		168,394 *
EL SEGUNDO	CALIFORNIA	168,394
AKRON UNIVERSITY OF		158 *
AKRON	OHIO	158
ALABAMA UNIVERSITY OF		785 *
BIRMINGHAM	ALABAMA	167
HUNTSVILLE	ALABAMA	420
UNIVERSITY	ALABAMA	198
ALASKA UNIVERSITY OF		8,119 *
FAIRBANKS CITY	ALASKA	8,119
AMERICAN FOUNDATION BIOLOGICAL		395 *
ROCKVILLE	MARYLAND	395
AMERICAN INSTITUTE BIOLOGICAL		317 *
ARLINGTON	VIRGINIA	317
AMERICAN INSTITUTE FOR RESEARCH		963 *
WASHINGTON	DC	810
BEDFORD	MASS	131
PALO ALTO	CALIFORNIA	22
AMERICAN MOSQUITO CONTROL ASSOC		12 *
FRESNO	CALIFORNIA	12
AMERICAN SOCIETY FOR ENGINEERING		95 *
WASHINGTON	DC	95
AMERICAN UNIVERSITY		148 *
WASHINGTON	DC	148
AMHERST COLLEGE		11 *
AMHERST	MASS	11
ANALYTIC SERVICES INC		6,591 *
ARLINGTON	VIRGINIA	5,998
FALLS CHURCH	VIRGINIA	50
WILLOW GROVE	PA	56
WRIGHT PATTERS	OHIO	493
ARIZONA STATE UNIVERSITY		361 *
TEMPE	ARIZONA	361
ARIZONA UNIVERSITY OF		3,785 *
TUCSON	ARIZONA	3,785
ARKANSAS UNIVERSITY OF		324 *
ARKADELPHIA	ARKANSAS	292
FAYETTEVILLE	ARKANSAS	32
ASSOCIATION FOR PHYS & SYS MATH		19 *
FRANCONIA	NH	19
ATLANTA UNIVERSITY OF		90 *
ATLANTA	GEORGIA	90
ATLANTIC COUNCIL		81 *
WASHINGTON	DC	81
AUBURN UNIVERSITY		544 *
AUBURN	ALABAMA	544
BATTELLE MEMORIAL INSTITUTE		11,354 *
WASHINGTON	DC	120
ABERDEEN PROV	MARYLAND	558
ADELPHI	MARYLAND	14
ATLANTA	GEORGIA	36
FORT DETRICK	MARYLAND	55
DOVER	NEW JERSEY	317
FREDERICK	MARYLAND	40
WHITE SANDS MS	NEW MEXICO	332
FORT KNOX	KENTUCKY	28
FORT MONMOUTH	NEW JERSEY	161
DURHAM	NCAR	221
FORT BELVOIR	VIRGINIA	42
FORT EUSTIS	VIRGINIA	27
FORT LEE	VIRGINIA	28
FORT MONROE	VIRGINIA	209
FORT BEN HARRI	INDIANA	30
NATICK	MASS	13
COLUMBUS	OHIO	7,561
HUNTSVILLE	ALABAMA	162
FORT GILLEM	GEORGIA	38
FORT GORDON	GEORGIA	18
RICHLAND	WASHINGTON	715
REDSTONE ARSEN	ALABAMA	483
WATERTOWN	MASS	22
RESEARCH TRIAN	NCAR	13
SAN DIEGO	CALIFORNIA	59
ROME	NEW YORK	16
WRIGHT PATTERS	OHIO	36
BAYLOR UNIVERSITY		256 *
DALLAS	TEXAS	50
HOUSTON	TEXAS	206
BETH ISRAEL HOSPITAL		59 *
NEW YORK	NEW YORK	59
BJORKSTEN RESEARCH LABORATORIES		153 *
MADISON	WISCONSIN	153
[illegible]OOD RESEARCH INSTITUTE INC		186 *
BOSTON	MASS	186
BOSTON COLLEGE		2,413 *
CHESTNUT HILL	MASS	1,758
HANSCOM AFB	MASS	327
NEWTON	MASS	114
WESTON	MASS	214
BOSTON UNIVERSITY		1,860 *
BOSTON	MASS	1,860
BOWLING GREEN STATE UNIVERSITY		41 *
BOWLING GREEN	OHIO	41
BRANDEIS UNIVERSITY		93 *
WALTHAM	MASS	93
BRIGHAM YOUNG UNIVERSITY		220 *
PROVO	UTAH	220
BROWN MORRIS COLLEGE		31 *
ATLANTA	GEORGIA	31
BROWN UNIVERSITY		916 *
PROVIDENCE	RI	916
CALIFORNIA INSTITUTE OF TECHNOLOGY		5,428 *
PASADENA	CALIFORNIA	5,428

- = MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
CALIFORNIA STATE COLLEGE		66 *
HAYWARD	CALIFORNIA	66
CALIFORNIA STATE OF		38 *
SACRAMENTO	CALIFORNIA	38
CALIFORNIA STATE UNIVERSITY		164 *
LONG BEACH	CALIFORNIA	26
NORTHRIDGE	CALIFORNIA	110
SACRAMENTO	CALIFORNIA	28
CALIFORNIA UNIVERSITY OF		29,679 *
BERKELEY	CALIFORNIA	7,264
DAVIS	CALIFORNIA	164
IRVINE	CALIFORNIA	1,980
LA JOLLA	CALIFORNIA	9,895
LOS ANGELES	CALIFORNIA	3,933
RIVERSIDE	CALIFORNIA	230
SAN DIEGO	CALIFORNIA	1,500
SAN FRANCISCO	CALIFORNIA	330
SANTA BARBARA	CALIFORNIA	1,017
SANTA CRUZ	CALIFORNIA	105
SEPULVEDA	CALIFORNIA	56
WRIGHT PATTERS	OHIO	3,205
CAPITOL RADIO ENGINEERING INST INC		1,582 *
SILVER SPRING	MARYLAND	1,582
CARNEGIE INSTITUTION OF WASHINGTON		99 *
WASHINGTON	DC	99
CARNEGIE MELLON UNIVERSITY		7,335 *
PITTSBURGH	PA	7,335
CASE WESTERN RESERVE UNIVERSITY		2,521 *
CLEVELAND	OHIO	2,521
CATHOLIC UNIVERSITY OF AMERICA		746 *
WASHINGTON	DC	746
CHARLES STARK DRAPER LABS INC		57,432 *
CAMBRIDGE	MASS	57,432
CHEMICAL INDUSTRY INST TOXICOLOGY		75 *
RESEARCH TRIAN	NCAR	75
CHICAGO UNIVERSITY		456 *
CHICAGO	ILLINOIS	456
CINCINNATI UNIVERSITY OF		449 *
CINCINNATI	OHIO	449
CITY UNIV OF NEW YORK RSCH FOUND		50 *
FLUSHING	NEW YORK	50
CITY UNIVERSITY OF NEW YORK		595 *
FLUSHING	NEW YORK	159
NEW YORK	NEW YORK	436
CLAREMONT COLLEGES & UNIV CENTER		50 *
CLAREMONT	CALIFORNIA	50
CLARK UNIVERSITY		13 *
WORCESTER	MASS	13
CLARKSON COLLEGE OF TECHNOLOGY		644 *
POTSDAM	NEW YORK	644
CLEMSON UNIVERSITY		497 *
CLEMSON	SCAR	487
CLEVELAND CLINIC		85 *
CLEVELAND	OHIO	85
COLORADO SCHOOL OF MINES		316 *
GOLDEN	COLORADO	316
COLORADO STATE UNIVERSITY		2,312 *
FORT COLLINS	COLORADO	2,312
COLORADO UNIVERSITY		1,396 *
BOULDER	COLORADO	1,275
DENVER	COLORADO	121
COLUMBIA UNIVERSITY		4,848 *
NEW YORK	NEW YORK	4,718
PALISADES	NEW YORK	130
CONFERENCE BOARD OF MATH SCIENCES		19 *
WASHINGTON	DC	19
CONNECTICUT UNIVERSITY OF		666 *
FARMINGTON	CONN	79
STORRS	CONN	587
COORDINATING RESEARCH COUNCIL INC		187 *
ATLANTA	GEORGIA	187
CORNELL UNIVERSITY		3,343 *
ITHACA	NEW YORK	3,078
NEW YORK	NEW YORK	265
DARTMOUTH COLLEGE		296 *
HANOVER	NH	296
DAYTON UNIVERSITY OF		13,859 *
KIRTLAND AFB	NEW MEXICO	3,242
EDWARDS AFB	CALIFORNIA	331
DAYTON	OHIO	5,988
WRIGHT PATTERS	OHIO	4,298
DECISION ANALYSIS & RSCH INSTITUTE		38 *
BOULDER	COLORADO	38
DELAWARE UNIVERSITY OF		631 *
NEWARK	DELAWARE	631
DENVER UNIVERSITY OF		885 *
DENVER	COLORADO	885
DREXEL UNIVERSITY		750 *
PHILADELPHIA	PA	750
DUKE UNIVERSITY		1,612 *
DURHAM	NCAR	1,612
EMMANUEL COLLEGE		622 *
BOSTON	MASS	63
LEXINGTON	MASS	559
EMORY UNIVERSITY		163 *
ATLANTA	GEORGIA	183
ENGINEERS COUNCIL FOR PROFESS DEV		245 *
NEW YORK	NEW YORK	245
ENVIRONMENTAL RSCH INST OF MICH		5,522 *
ANN ARBOR	MICHIGAN	5,522
EUROPEAN AMERICAN INST SCTY RSCH		30 *
MARINA DEL REY	CALIFORNIA	30

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DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
FAIRLEIGH DICKINSON UNIVERSITY		68 *
HACKENSACK	NEW JERSEY	68
FLORIDA ATLANTIC UNIVERSITY		28 *
BOCA RATON	FLORIDA	28
FLORIDA DEPARTMENT OF NATURAL RES		88 *
TALLAHASSEE	FLORIDA	88
FLORIDA GAME & FRESH WATER FISH		96 *
TALLAHASSEE	FLORIDA	96
FLORIDA INSTITUTE OF TECHNOLOGY		65 *
MELBOURNE	FLORIDA	65
FLORIDA INTERNATIONAL UNIVERSITY		12 *
MIAMI	FLORIDA	12
FLORIDA STATE UNIVERSITY		1,389 *
GAINESVILLE	FLORIDA	171
TALLAHASSEE	FLORIDA	1,218
FLORIDA TECHNOLOGICAL UNIVERSITY		759 *
ORLANDO	FLORIDA	759
FLORIDA UNIVERSITY		1,503 *
GAINESVILLE	FLORIDA	1,503
FORT VALLEY STATE COLLEGE		16 *
ROBINS AFB	GEORGIA	16
FRANKLIN INSTITUTE OF PENNSYLVANIA		288 *
PHILADELPHIA	PA	288
FRANKLIN INSTITUTE RESEARCH LAB		125 *
PHILADELPHIA	PA	125
GEOPHYSICAL INSTITUTE OF ALASKA		144 *
COLLEGE VILLAG	ALASKA	106
FAIRBANKS CITY	ALASKA	38
GEORGE WASHINGTON UNIVERSITY		2,680 *
WASHINGTON	DC	2,680
GEORGETOWN UNIVERSITY		1,025 *
WASHINGTON	DC	1,025
GEORGIA INSTITUTE TECH		3,833 *
ATLANTA	GEORGIA	3,732
PANAMA CITY	FLORIDA	101
GEORGIA STATE COLLEGE		38 *
ATLANTA	GEORGIA	38
GEORGIA TECH RESEARCH INSTITUTE		14,758 *
ATLANTA	GEORGIA	14,758
GEORGIA UNIVERSITY OF		336 *
ATHENS	GEORGIA	336
GILLETTE RESEARCH INSTITUTE INC		38 *
ROCKVILLE	MARYLAND	38
GORGAS MEMORIAL INSTITUTE OF TROPI		257 *
WASHINGTON	DC	257
GULF SOUTH RESEARCH INSTITUTE		138 *
NEW ORLEANS	LOUISIANA	138
HAHNEMANN MEDICAL COLLEGE & HOSPIT		236 *
PHILADELPHIA	PA	236
HAMPTON INSTITUTE		135 *
HAMPTON	VIRGINIA	135
HARVARD UNIVERSITY		4,908 *
BEDFORD	MASS	66
BOSTON	MASS	97
CAMBRIDGE	MASS	4,745
HAWAII UNIVERSITY OF		2,832 *
HONOLULU CITY	HAWAII	2,761
PEARL HARBOR	HAWAII	71
HOUSTON UNIVERSITY OF		709 *
HOUSTON	TEXAS	709
HOWARD UNIVERSITY		504 *
WASHINGTON	DC	504
HUDSON INSTITUTE		471 *
CROTON ON HUDS	NEW YORK	471
HUMAN RESOURCES RESEARCH ORGN		2,425 *
	GERMANY	615
ALEXANDRIA	VIRGINIA	1,810
ILLINOIS INSTITUTE TECHNOLOGY		26,319 *
ANNAPOLIS	MARYLAND	20,079
CHICAGO	ILLINOIS	4,690
GRIFFISS AFB	NEW YORK	261
ROME	NEW YORK	1,137
WRIGHT PATTERS	OHIO	152
ILLINOIS RESEARCH INSTITUTE		39 *
GRIFFISS AFB	NEW YORK	39
ILLINOIS UNIVERSITY OF		6,797 *
CHAMPAIGN	ILLINOIS	315
CHICAGO	ILLINOIS	1,046
URBANA	ILLINOIS	5,436
ILLUMINATING ENGRG RSCH INSTITUTE		25 *
NEW YORK	NEW YORK	25
INDIANA UNIVERSITY		754 *
BLOOMINGTON	INDIANA	566
INDIANAPOLIS	INDIANA	188
INDIANA UNIVERSITY FOUNDATION		25 *
INDIANAPOLIS	INDIANA	25
INDIANAPOLIS CTR FOR ADVANCE RSCH		51 *
INDIANAPOLIS	INDIANA	51
INSECTS AFFECTING MAN ANIMALS RSCH		19 *
GAINESVILLE	FLORIDA	19
INSTITUTE ATMOSPHERIC OPTICS REMOT		63 *
HAMPTON	VIRGINIA	63
INSTITUTE FOR ADVANCED STUDY		28 *
PRINCETON	NEW JERSEY	28
INSTITUTE FOR DEFENSE ANALYSIS		14,064 *
ARLINGTON	VIRGINIA	14,064
INSTITUTE FOR EXP PSYCHIATRY INC		57 *
MERION	PA	57
INSTITUTE FOR RESEARCH INC		98 *
OFFUTT AFB	NEBRASKA	24
STATE COLLEGE	PA	74

* MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
INSTITUTE FOR STATICS & DYNAMICS		79 *
HOUSTON	TEXAS	79
INSTITUTE FOREIGN POLICY ANALYSIS		284 *
CAMBRIDGE	MASS	284
INSTITUTE MEDICAL RSCH SANTA CLARA		44 *
SAN JOSE	CALIFORNIA	44
INSTITUTE OF COMPARATIVE CULT STUD		94 *
WASHINGTON	DC	94
INSTITUTE OF MEDICAL SCIENCES		59 *
SAN FRANCISCO	CALIFORNIA	59
INTERNATIONAL RESEARCH INSTITUTE		171 *
MCLEAN	VIRGINIA	171
IOWA STATE UNIV OF SCIENCE & TECH		422 *
AMES	IOWA	422
IOWA UNIVERSITY OF		984 *
AMES	IOWA	181
IOWA CITY	IOWA	803
JACKSON STATE UNIVERSITY		125 *
JACKSON	MISS	125
JOHN CARROLL UNIVERSITY		121 *
CLEVELAND	OHIO	121
JOHNS HOPKINS UNIVERSITY		163,327 *
BALTIMORE	MARYLAND	859
SCAGGSVILLE	MARYLAND	162,454
SILVER SPRING	MARYLAND	15
KANSAS STATE UNIVERSITY		459 *
MANHATTAN	KANSAS	459
KANSAS UNIVERSITY OF		547 *
KANSAS CITY	KANSAS	168
LAWRENCE	KANSAS	379
KENT STATE UNIVERSITY		17 *
KENT	OHIO	17
KENTUCKY RESEARCH FOUNDATION		181 *
LEXINGTON	KENTUCKY	181
LA JOLLA INSTITUTE		498 *
ROCKVILLE	MARYLAND	39
LA JOLLA	CALIFORNIA	430
SAN DIEGO	CALIFORNIA	29
LEHIGH UNIVERSITY		1,701 *
BETHLEHEM	PA	1,701
LOGISTICS MANAGEMENT INSTITUTE		3,289 *
WASHINGTON	DC	3,289
LOUISIANA POLYTECHNIC INSTITUTE		20 *
RUSTON	LOUISIANA	20
LOUISIANA STATE UNIVERSITY OF		1,078 *
BATON ROUGE	LOUISIANA	946
NEW ORLEANS	LOUISIANA	132*
LOUISVILLE UNIVERSITY OF		40-*
LOUISVILLE	KENTUCKY	40-
LOWELL OBSERVATORY		27 *
FLAGSTAFF	ARIZONA	27
LOWELL STATE COLLEGE		59 *
LOWELL	MASS	59
LOWELL TECHNOLOGICAL INSTITUTE		377 *
LOWELL	MASS	377
MAINE UNIVERSITY OF		88 *
ORONO	MAINE	88
MARYLAND UNIVERSITY OF		4,619 *
BALTIMORE	MARYLAND	546
CAMBRIDGE	MARYLAND	36
COLLEGE PARK	MARYLAND	3,837
MASSACHUSETTS GENERAL HOSPITAL		92 *
BOSTON	MASS	92
MASSACHUSETTS INSTITUTE TECHNOLOGY		154,564 *
CAMBRIDGE	MASS	25,315
LEXINGTON	MASS	129,249
MASSACHUSETTS UNIVERSITY OF		1,491 *
AMHERST	MASS	1,361
WORCESTER	MASS	130
MAYO FOUNDATION		62 *
ROCHESTER	MINNESOTA	62
MEDICAL COLLEGE OF SOUTH CAROLINA		35 *
CHARLESTON	SCAR	35
MEDICAL COLLEGE OF WISCONSIN		186 *
MILWAUKEE	WISCONSIN	186
MIAMI UNIVERSITY		314 *
OXFORD	OHIO	69
WRIGHT PATTERS	OHIO	245
MIAMI UNIVERSITY OF		2,141 *
CORAL GABLES	FLORIDA	1,919
MIAMI	FLORIDA	222
MICHAEL REESE RESEARCH FOUNDATION		255 *
CHICAGO	ILLINOIS	255
MICHIGAN STATE DEPT OF HEALTH		19 *
LANSING	MICHIGAN	19
MICHIGAN STATE UNIVERSITY		753 *
EAST LANSING	MICHIGAN	753
MICHIGAN TECHNOLOGICAL UNIVERSITY		675 *
HOUGHTON	MICHIGAN	675
MICHIGAN UNIVERSITY OF		2,312 *
ANN ARBOR	MICHIGAN	2,312
MICROSURGICAL TRANSPLANT RES FOUND		28 *
SAN MATEO	CALIFORNIA	28
MIDWEST RESEARCH INSTITUTE		754 *
KANSAS CITY	MISSOURI	754
MILITARY OPERATIONS RESEARCH SOC		59 *
ALEXANDRIA	VIRGINIA	59
MINNESOTA UNIVERSITY OF		1,380 *
MINNEAPOLIS	MINNESOTA	695
ST PAUL	MINNESOTA	685

- = MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
MISSISSIPPI STATE UNIVERSITY		174 *
MISSISSIPPI CI	MISS	31
STATE COLLEGE	MISS	143
MISSISSIPPI UNIVERSITY OF		199 *
JACKSON	MISS	65
UNIVERSITY	MISS	134
MISSOURI UNIVERSITY OF		1,118 *
COLUMBIA	MISSOURI	861
KANSAS CITY	MISSOURI	73
ROLLA	MISSOURI	184
MITRE CORP		110,330 *
	GREECE	896
BEDFORD	MASS	109,258
MCLEAN	VIRGINIA	176
MONTANA STATE UNIVERSITY		295 *
BOZEMAN	MONTANA	295
MONTEFIORE HOSPITAL MEDICAL CENTER		79 *
NEW YORK	NEW YORK	79
MOUNT SINAI HOSPITAL		161 *
NEW YORK	NEW YORK	161
NARCOTIC & DRUG RESEARCH INC		22-*
ALBANY	NEW YORK	22-
NATIONAL CNCL SOVIET E EUROPE RSCH		1,278 *
CAMBRIDGE	MASS	1,278
NATIONAL INST FOR STUDY RACE & MIL		33 *
WASHINGTON	DC	33
NATIONAL STRATEGY INFO CENTER INC		58 *
NEW YORK	NEW YORK	58
NATIONAL URBAN LEAGUE INC		188 *
CHICAGO	ILLINOIS	188
NEBRASKA UNIVERSITY OF		194 *
LINCOLN	NEBRASKA	194
NEVADA UNIVERSITY OF		365 *
RENO	NEVADA	365
NEW ENGLAND MEDICAL CENTER HOSPITL		43 *
BOSTON	MASS	43
NEW HAMPSHIRE UNIVERSITY OF		335 *
DURHAM	NH	335
NEW JERSEY INSTITUTE OF TECHNOLOGY		181 *
NEWARK	NEW JERSEY	181
NEW MEXICO INSTITUTE MINING & TECH		2,028 *
SOCORRO	NEW MEXICO	2,028
NEW MEXICO STATE UNIVERSITY		3,492 *
LAS CRUCES	NEW MEXICO	2,555
YUMA	ARIZONA	28
WHITE SANDS MR	NEW MEXICO	909
NEW MEXICO UNIVERSITY OF		5,472 *
ALBUQUERQUE	NEW MEXICO	384
KIRTLAND AFB	NEW MEXICO	5,058
LAS CRUCES	NEW MEXICO	30
NEW ORLEANS UNIVERSITY OF		58 *
NEW ORLEANS	LOUISIANA	58
NEW YORK ACADEMY OF SCIENCES		11 *
NEW YORK	NEW YORK	11
NEW YORK BLOOD CENTER INC		75 *
NEW YORK	NEW YORK	75
NEW YORK POLYTECHNIC INSTITUTE		2,108 *
BROOKLYN	NEW YORK	1,976
NEW YORK	NEW YORK	132
NEW YORK STATE UNIV RESEARCH FOUND		1,922 *
ALBANY	NEW YORK	1,600
BUFFALO	NEW YORK	101
STONY BROOK	NEW YORK	221
NEW YORK STATE UNIVERSITY OF		470 *
ALBANY	NEW YORK	411
NEW YORK	NEW YORK	59
NEW YORK UNIVERSITY		1,432 *
NEW YORK	NEW YORK	1,432
NEW YORK UNIVERSITY MEDICAL CENTER		58 *
NEW YORK	NEW YORK	58
NORTH CAROLINA AGRI & TECH STATE U		244 *
GREENSBORO	NCAR	244
NORTH CAROLINA STATE UNIVERSITY		697 *
CHAPEL HILL	NCAR	58
RALEIGH	NCAR	639
NORTH CAROLINA UNIVERSITY OF		785 *
CHAPEL HILL	NCAR	725
WILMINGTON	NCAR	60
NORTH TEXAS STATE UNIVERSITY		263 *
DENTON	TEXAS	263
NORTHEASTERN RESEARCH FOUNDATION		134 *
BOOTHBAY HARBO	MAINE	134
NORTHEASTERN UNIVERSITY		1,281 *
BOSTON	MASS	1,281
NORTHERN ILLINOIS UNIVERSITY		26 *
DE KALB	ILLINOIS	26
NORTHWEST REGIONAL EDUCATIONAL LAB		65 *
PORTLAND	OREGON	65
NORTHWESTERN UNIVERSITY		2,408 *
CHICAGO	ILLINOIS	83
EVANSTON	ILLINOIS	2,325
NOTRE DAME UNIVERSITY OF		399 *
NOTRE DAME	INDIANA	399
NOVA UNIVERSITY OF ADVANCED TECH		125 *
FORT LAUDERDAL	FLORIDA	44
MELBOURNE	FLORIDA	81
OAKLAND UNIVERSITY		153 *
ROCHESTER	MICHIGAN	153
OHIO MEDICAL COLLEGE		134 *
TOLEDO	OHIO	134

- MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS RECEIVING PRIME CONTRACTS OVER $10,000 FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
OHIO STATE UNIV RESERCH FOUNDATION		2,545 *
COLUMBUS	OHIO	2,545
OHIO STATE UNIVERSITY THE		806 *
COLUMBUS	OHIO	806
OHIO UNIVERSITY		64 *
ATHENS	OHIO	64
OHIO WESLEYAN UNIVERSITY		20 *
DELAWARE	OHIO	20
OKLAHOMA STATE UNIVERSITY OF		1,923 *
EGLIN AFB	FLORIDA	1,095
STILLWATER	OKLAHOMA	828
OKLAHOMA UNIVERSITY OF		528 *
NORMAN	OKLAHOMA	499
OKLAHOMA CITY	OKLAHOMA	29
OLD DOMINION COLLEGE		99 *
NORFOLK	VIRGINIA	99
OLD DOMINION UNIVERSITY RSCH FOUND		76 *
NORFOLK	VIRGINIA	76
OPTICAL SOCIETY OF AMERICA		15 *
WASHINGTON	DC	15
ORANGE COUNTY POLLUTION CONTROL BD		55 *
ORLANDO	FLORIDA	55
OREGON GRADUATE CTR FOR STUDY RES		134 *
BEAVERTON	OREGON	134
OREGON STATE OF		78 *
CORVALLIS	OREGON	78
OREGON STATE UNIVERSITY		2,363 *
CORVALLIS	OREGON	2,363
OREGON UNIVERSITY OF		222 *
EUGENE	OREGON	158
PORTLAND	OREGON	64
PALISADES GEOPHYSICAL INSTITUTE		1,283 *
BLAUVELT	NEW YORK	124
WEST NYACK	NEW YORK	1,159
PALISADES INSTITUTE		1,057 *
NEW YORK	NEW YORK	1,057
PASADENA FOUNDATION MEDICAL RSCH		50 *
PASADENA	CALIFORNIA	50
PENNSYLVANIA COLLEGE OF OPTOMETRY		18 *
PHILADELPHIA	PA	18
PENNSYLVANIA HOSPITAL CONTRIBUTORS		115 *
PHILADELPHIA	PA	115
PENNSYLVANIA STATE UNIVERSITY		12,226 *
STATE COLLEGE	PA	625
UNIVERSITY PAR	PA	11,601
PENNSYLVANIA UNIVERSITY OF		4,900 *
WASHINGTON	DC	170
PHILADELPHIA	PA	4,730
PETER BENT BRIGHAM HOSPITAL		257 *
BOSTON	MASS	257
PITTSBURGH UNIVERSITY OF		2,083 *
PITTSBURGH	PA	2,083
PORTLAND STATE UNIVERSITY		55 *
PORTLAND	OREGON	55
PRINCETON UNIVERSITY		2,263 *
PRINCETON	NEW JERSEY	2,263
PUERTO RICO UNIVERSITY OF		79 *
SAN JUAN	PUERTO RCO	79
PURDUE RESEARCH FOUNDATION		1,307 *
LAFAYETTE	INDIANA	304
WEST LAFAYETTE	INDIANA	1,003
PURDUE UNIVERSITY		116 *
WEST LAFAYETTE	INDIANA	116
QUEENS HOSPITAL MEDICAL CENTER		47 *
HONOLULU CITY	HAWAII	47
RAND CORP		18,834 *
SANTA MONICA	CALIFORNIA	18,834
REGIS COLLEGE		393 *
WESTON	MASS	393
RENSSELAER POLYTECHNIC INSTITUTE		1,499 *
TROY	NEW YORK	1,499
RESEARCH FOUNDATION FOR MENTAL HYG		30 *
ALBANY	NEW YORK	30
RESEARCH INSTITUTE OF COLORADO		23 *
FORT COLLINS	COLORADO	23
RESEARCH TRIANGLE INSTITUTE		859 *
RESEARCH TRIAN	NCAR	859
RHODE ISLAND UNIVERSITY OF		1,659 *
KINGSTON	RI	1,659
RICE UNIVERSITY		487 *
HOUSTON	TEXAS	487
RIVERSIDE RESEARCH INSTITUTE		3,167 *
ARLINGTON	VIRGINIA	232
NEW YORK	NEW YORK	2,935
ROCHESTER INSTITUTE OF TECHNOLOGY		94 *
ROCHESTER	NEW YORK	94
ROCHESTER UNIVERSITY OF		15,480 *
ARLINGTON	VIRGINIA	11,926
ROCHESTER	NEW YORK	3,554
ROCKEFELLER UNIVERSITY		113 *
NEW YORK	NEW YORK	113
RUTGERS UNIVERSITY		526 *
NEW BRUNSWICK	NEW JERSEY	496
PISCATAWAY	NEW JERSEY	30
S R I INTERNATIONAL		28,384 *
ARLINGTON	VIRGINIA	277
MENLO PARK	CALIFORNIA	27,924
MOFFETT FIELD	CALIFORNIA	95
SAN FRANCISCO	CALIFORNIA	88

- = MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS
RECEIVING PRIME CONTRACTS OVER $10,000 FOR
RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
SAINT LOUIS UNIVERSITY		186 *
ST LOUIS	MISSOURI	186
SALK INSTITUTE THE		1,577 -
SWIFTWATER	PA	1,577
SAN DIEGO SOCIETY OF NATURAL HISTO		33 *
SAN DIEGO	CALIFORNIA	33
SAN DIEGO STATE COLLEGE FOUNDATION		88 *
SAN DIEGO	CALIFORNIA	88
SAN DIEGO UNIVERSITY FOUNDATION		307 *
SAN DIEGO	CALIFORNIA	307
SAN FRANCISCO UNIVERSITY OF		26 *
SAN FRANCISCO	CALIFORNIA	26
SAN JOSE STATE UNIVERSITY FOUND		271 *
LONG BEACH	CALIFORNIA	249
NORTHRIDGE	CALIFORNIA	22
SCRIPPS CLINIC RESEARCH		155 *
LA JOLLA	CALIFORNIA	155
SOCIETY OF AUTOMOTIVE ENGINEERS		41 *
WARRENDALE	PA	41
SOUTH ALABAMA UNIVERSITY OF		65 *
MOBILE	ALABAMA	65
SOUTH CAROLINA UNIVERSITY OF		683 *
COLUMBIA	SCAR	683
SOUTH CAROLINE WILDLIFE RESOURCES		13 *
HARTWELL	GEORGIA	13
SOUTH DAKOTA SCHOOL OF MINES TECH		32 *
RAPID CITY	SDAK	32
SOUTH DAKOTA UNIVERSITY OF		28 *
VERMILLION	SDAK	28
SOUTH FLORIDA UNIVERSITY OF		251 *
TAMPA	FLORIDA	251
SOUTHEASTERN CTR ELECT ENGR EDUC		1,621 *
AUBURN	ALABAMA	320
ORLANDO	FLORIDA	1,261
ST CLOUD	FLORIDA	40
SOUTHEASTERN MASS TECH INSTITUTE		82 *
DARTMOUTH	MASS	64
NORTH DARTMOUT	MASS	18
SOUTHERN CALIFORNIA UNIVERSITY OF		10,260 *
LOS ANGELES	CALIFORNIA	10,170
MARINA DEL REY	CALIFORNIA	90
SOUTHERN ILLINOIS UNIVERSITY		31 *
EDWARDSVILLE	ILLINOIS	31
SOUTHERN METHODIST UNIVERSITY OF		372 *
DALLAS	TEXAS	372
SOUTHERN RESEARCH INSTITUTE		1,111 *
BIRMINGHAM	ALABAMA	1,111
SOUTHERN UNIVERSITY & A & M COL		28 *
BATON ROUGE	LOUISIANA	28
SOUTHWEST RESEARCH INSTITUTE		7,838 *
SAN ANTONIO	TEXAS	7,838
SPEECH COMMUNICATIONS RESEARCH LAB		140 *
SANTA BARBARA	CALIFORNIA	140
STANFORD UNIVERSITY		18,068 *
MENLO PARK	CALIFORNIA	50
PALO ALTO	CALIFORNIA	230
STANFORD	CALIFORNIA	17,788
STERLING INSTITUTE		239 *
WASHINGTON	DC	239
STEVENS INSTITUTE OF TECHNOLOGY		1,662 *
HOBOKEN	NEW JERSEY	1,662
SYRACUSE RESEARCH CORP		912 *
SYRACUSE	NEW YORK	912
SYRACUSE UNIVERSITY		1,774 *
ROME	NEW YORK	188
SYRACUSE	NEW YORK	1,586
SYRACUSE UNIVERSITY RESEARCH CORP		1,648 *
SYRACUSE	NEW YORK	1,648
TALLADEGA COLLEGE		35 *
TALLADEGA	ALABAMA	35
TEMPLE UNIVERSITY		29 *
PHILADELPHIA	PA	29
TENNESSEE STATE UNIVERSITY		72 *
NASHVILLE	TENNESSEE	72
TENNESSEE UNIVERSITY OF		1,581 *
KNOXVILLE	TENNESSEE	1,265
MEMPHIS	TENNESSEE	42
TULLAHOMA	TENNESSEE	274
TEXAS A & M RESEARCH FOUNDATION		2,496 *
COLLEGE STATIO	TEXAS	2,396
SAVANNAH	GEORGIA	100
TEXAS A & M UNIVERSITY		116 *
COLLEGE STATIO	TEXAS	116
TEXAS CHRISTIAN UNIVERSITY		160 *
FORT WORTH	TEXAS	160
TEXAS TECHNOLOGICAL COLLEGE		1,038 *
LUBBOCK	TEXAS	1,038
TEXAS UNIVERSITY OF		15,772 *
ARLINGTON	TEXAS	95
AUSTIN	TEXAS	14,420
DALLAS	TEXAS	180
EL PASO	TEXAS	188
GALVESTON	TEXAS	257
HOUSTON	TEXAS	52
RICHARDSON	TEXAS	530
SAN ANTONIO	TEXAS	50
TRINITY UNIVERSITY		115 *
SAN ANTONIO	TEXAS	115
TRUDEAU INSTITUTE INC		14 *
SARANAC LAKE	NEW YORK	14

* MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE

EDUCATIONAL AND NON-PROFIT INSTITUTIONS

RECEIVING PRIME CONTRACTS OVER $10,000 FOR

RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART I - U.S. INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION		THOUSANDS OF DOLLARS
TUFTS UNIVERSITY		228 *
BOSTON	MASS	53
MEDFORD	MASS	175
TULANE UNIVERSITY OF LOUISIANA		138 *
COVINGTON	LOUISIANA	75
NEW ORLEANS	LOUISIANA	63
TULSA UNIVERSITY OF		20 *
TULSA	OKLAHOMA	20
UNDERSEA MEDICAL SOCIETY INC		142 *
BETHESDA	MARYLAND	142
UNION COLLEGE & UNIVERSITY		20 *
SCHENECTADY	NEW YORK	20
UNITED STATES INTERNATIONAL UNIVER		18 *
SAN DIEGO	CALIFORNIA	18
UNIVERSITY HOSPITAL INC		65 *
BOSTON	MASS	65
UTAH STATE UNIVERSITY		4,511 *
LOGAN	UTAH	4,511
UTAH UNIVERSITY OF		1,205 *
DUGWAY	UTAH	34
SALT LAKE CITY	UTAH	1,171
VALDOSTA STATE COLLEGE		16 *
VALDOSTA	GEORGIA	16
VANDERBILT UNIVERSITY		136 *
NASHVILLE	TENNESSEE	136
VERMONT UNIVERSITY OF		70 *
BURLINGTON	VERMONT	70
VIRGINIA COMMONWEALTH UNIVERSITY		144 *
RICHMOND	VIRGINIA	144
VIRGINIA INST OF MARINE SCIENCES		26 *
GLOUCESTER POI	VIRGINIA	26
VIRGINIA MASON RESEARCH CENTER		101 *
SEATTLE	WASHINGTON	101
VIRGINIA MILITARY INSTITUTE		11 *
LEXINGTON	VIRGINIA	11
VIRGINIA POLYTECHNIC INSTITUTE		1,887 *
BLACKSBURG	VIRGINIA	1,887
VIRGINIA UNIVERSITY OF		1,210 *
CHARLOTTESVILL	VIRGINIA	1,210
WASHINGTON BOOKER T FOUNDATION		998 *
WASHINGTON	DC	998
WASHINGTON STATE UNIVERSITY		638 *
PULLMAN	WASHINGTON	638
WASHINGTON UNIVERSITY		1,067 *
ST LOUIS	MISSOURI	1,067
WASHINGTON UNIVERSITY OF		10,069 *
SEATTLE	WASHINGTON	10,069
WAYNE STATE UNIVERSITY		627 *
DETROIT	MICHIGAN	627
WENTWORTH INSTITUTE		2,030
BOSTON	MASS	2,030
WEST FLORIDA UNIVERSITY OF		150 *
PENSACOLA	FLORIDA	150
WEST VIRGINIA UNIVERSITY		47
MORGANTOWN	WVA	47
WESTERN KENTUCKY UNIVERSITY		23 *
BOWLING GREEN	KENTUCKY	23
WESTERN MICHIGAN UNIVERSITY		19 *
KALAMAZOO	MICHIGAN	19
WICAT INC		275 *
OREM	UTAH	275
WILLIAM & MARY COLLEGE OF		42 *
WILLIAMSBURG	VIRGINIA	42
WILLIAMS COLLEGE		120 *
WILLIAMSTOWN	MASS	120
WISCONSIN UNIVERSITY OF		3,452 *
MADISON	WISCONSIN	3,387
MILWAUKEE	WISCONSIN	35
PLATTEVILLE	WISCONSIN	30
WISTAR INSTITUTE OF ANATOMY BIOLGY		67 *
PHILADELPHIA	PA	67
WOODS HOLE OCEANOGRAPHIC INST		8,681 *
WOODS HOLE	MASS	8,681
WORCESTER POLYTECHNIC INSTITUTE		103 *
WORCESTER	MASS	103
WRIGHT STATE UNIVERSITY		243 *
DAYTON	OHIO	188
WRIGHT PATTERS	OHIO	55
WYOMING UNIVERSITY OF		435 *
LARAMIE	WYOMING	435
YALE UNIVERSITY		3,616 *
NEW HAVEN	CONN	3,616
YESHIVA UNIVERSITY		95 *
BRONX	NEW YORK	95
		1,136,467

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DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS RECEIVING PRIME CONTRACTS OVER $10,000 FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART II - U.S. GOVERNMENT AGENCIES

NAME OF CONTRACTOR AND LOCATION	THOUSANDS OF DOLLARS	NAME OF CONTRACTOR AND LOCATION	THOUSANDS OF DOLLARS
ARGONNE NATIONAL LABORATORY	12 *		
ARGONNE ILLINOIS	12		
NATIONAL ACADEMY OF SCIENCES	6,580 *		
WASHINGTON DC	6,452		
WHITE SANDS MS NEW MEXICO	128		
NATIONAL SCIENCE FOUNDATION	1,694 *		
WASHINGTON DC	1,694		
SMITHSONIAN INSTITUTION	977 *		
WASHINGTON DC	429		
CAMBRIDGE MASS	548		
UNITED STATES CENTRL INTELGNCE AGY	150 *		
WASHINGTON DC	150		
UNITED STATES COMMERCE DEPT	2,292 *		
WASHINGTON DC	1,555		
BOULDER COLORADO	515		
GAITHERSBURG MARYLAND	86		
ROCKVILLE MARYLAND	50		
SEATTLE WASHINGTON	65		
NORMAN OKLAHOMA	21		
UNITED STATES ENERGY DEPT	553 *		
ARGONNE ILLINOIS	38		
OAK RIDGE TENNESSEE	60		
LIVERMORE CALIFORNIA	200		
OAKLAND CALIFORNIA	255		
UNITED STATES H E W DEPT	42 *		
ANCHORAGE CITY ALASKA	42		
UNITED STATES LABOR DEPT	93 *		
WASHINGTON DC	93		
UNITED STATES NATL AERO SPACE AGY	14,991 *		
RIDGELEY WVA	14,991		
UNITED STATES PATENT OFFICE	80 *		
WASHINGTON DC	80		
	27,464		

- = MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

DEPARTMENT OF DEFENSE
EDUCATIONAL AND NON-PROFIT INSTITUTIONS RECEIVING PRIME CONTRACTS OVER $10,000 FOR RESEARCH, DEVELOPMENT, TEST AND EVALUATION WORK

FISCAL YEAR 1980

PART III - FOREIGN INSTITUTIONS

NAME OF CONTRACTOR AND LOCATION	THOUSANDS OF DOLLARS
BEN GURION UNIVERSITY OF THE NEGEV ISRAEL	45 * 45
BRISTOL UNIVERSITY OF UN KINGDOM	21 * 21
BRUNEL UNIVERSITY UN KINGDOM	54 * 54
CAIRO AMERICAN COLLEGE EGYPT	14 * 14
CAMBRIDGE UNIVERSITY OF UN KINGDOM	20 * 20
CIUDAD UNIVERSITARIA SPAIN	20 * 20
COMMUNICATIONS STUDIES & PLANNING UN KINGDOM	194 * 194
ECOLE POLYTECHQUE FEDERALE SWITZERLND	25 * 25
EDINBURGH UNIVERSITY OF UN KINGDOM	25 * 25
FEDERAL INSTITUTE OF TECHNOLOGY SWITZERLND	34 * 34
FREE UNIVERSITY OF BRUSSELS BELGIUM	34 * 34
GRAZ TECHNICAL UNIVERSITY OF AUSTRIA	16 * 16
HEBREW UNIVERSITY ISRAEL	45 * 45
IMPERIAL COLLEGE OF SCIENCE & TECH UN KINGDOM	225 * 225
INSTITUT FUER ATMOSPHAERISCHE GERMANY	47 * 47
INVERESK RESEARCH INTERNATIONAL UN KINGDOM	281 * 281
ISRAEL INSTITUTE OF APPLD SOC RSCH ISRAEL	30 * 30
LEEDS UNIVERSITY OF UN KINGDOM	15 * 15
LONDON UNIVERSITY OF UN KINGDOM	53 * 53
MANCHESTER UNIVERSITY UN KINGDOM	263 * 263
MCGILL UNIVERSITY CANADA	46 * 46
NATIONAL INST CAREER EDUC & COUNSL UN KINGDOM	24 * 24
NATIONAL RESEARCH COUNCIL CANADA	12 * 12
NORTH WALES UNIVERSITY COLLEGE OF UN KINGDOM	15 * 15
NORWEGIAN DEFENSE RESEARCH ESTABMT NORWAY	19 * 19
NOTTINGHAM UNIVERSITY OF UN KINGDOM	24 * 24
OXFORD UNIVERSITY UN KINGDOM	15 * 15
QUEENSLAND UNIVERSITY AUSTRIA	35 * 35
ROYAL INSTITUTION THE UN KINGDOM	13 * 13
ROYAL NORWEGIAN CNCL SCNTFC IND RS NORWAY	1,410 * 1,410
ROYAL NORWEGIAN NAV MAT COMM NORWAY	4,915 * 4,915
SALFORD UNIVERSITY OF UN KINGDOM	63 * 63
SOCIETE NATIONALE INDUSTRIELLE FRANCE	36 * 36
TAVISTOCK INSTITUTE OF HUMAN REL UN KINGDOM	47 * 47
TEL AVIV UNIVERSITY ISRAEL	119 * 119
TORONTO UNIVERSITY OF CANADA	43 * 43
ULSTER THE NEW UNIVERSITY OF UN KINGDOM	20 * 20
UNITED KINGDOM DEPT OF INDUSTRY UN KINGDOM	12 * 12
UNITED KINGDOM GENERAL POST OFFICE UN KINGDOM	15 * 15
UNITED KINGDOM MINISTRY OF DEFENCE UN KINGDOM	247 * 247
UNIVERSITAET WIEN AUSTRIA	40 * 40
VIENNA TECHNICAL UNIVERSITY OF GERMANY	50 * 50
WEIZMANN INSTITUTE OF SCIENCE ISRAEL	21 * 21
YORK UNIVESITY CANADA	23 * 23
	8,725

- = MINUS AMOUNT (CANCELLATIONS EXCEED NEW AWARDS)

Senator Stevens: How does the Defense Department control and allocate Independent Research and Development funds?

Dr. Wade: IR&D/B&P is governed by PL 91-441, Section 203, and PL 96-342, Section 208. The Defense Acquisition Regulations (DAR) set forth detailed principles governing contractor recovery of IR&D/B&P costs. DoD policy and management is described in DoDD 5100.66, "Establishment of Policy for, and Technical Evaluation of, Independent Research and Development". Salient provisions of these authorities are:

- IR&D payments by DoD can be made only for work which has a potential relationship to a military function or operation.
- Ceilings for contractor recovery of IR&D/B&P costs must be set by negotiated advance agreements in the case of companies which received more than $4 million of IR&D/B&P in the previous year. We estimate that 85-90 percent of the IR&D/B&P effort is in this category. Smaller companies which do not negotiate advance agreements have ceilings set by a formula based on their historical expenditures.
- DoD reimbursement of IR&D/B&P may not exceed the dollar amount of projects deemed to have a potential military relationship (PMR).

The DoD IR&D Policy Council, chaired by USDRE, is the top policy body for IR&D/B&P. Policy Council members include the Principal DUSDRE, ASD(C), DUSD(R&AT), DUSD(AP), and the Assistant Secretaries of the Army (RD&A), Navy (RE&S) and (MRA&L), and Air Force (RD&L).

Technical evaluation under the Policy Council is the responsibility of the Technical Evaluation Group (TEG), chaired by the Director for Research in ODUSD(R&AT), with the Military Department IR&D Technical Managers as its members. The latter manage technical evaluations of contractor programs assigned to their Services.

Negotiations are conducted by specialized central offices established for that purpose by the Military Departments in their material commands.

Prior to its company's fiscal year, each contractor provides the TEG with a description of IR&D projects planned for that year. If the cognizant Service judges that projects do not have PMR, the other two Services then review such projects for potential relationships to their Services. This is done by or through the TEG. A project deemed relevant to any one of the three Services will be considered to have PMR. Projects which are found to be non-PMR by all Services are identified to the Service negotiator who ensures that no reimbursement will be made.

If the contractor's description is inadequate to allow a PMR determination, the contractor will be given an opportunity to provide additional information to the TEG and to separate the project into relevant and non-relevant tasks for further consideration.

Beyond a determination of PMR, the IR&D projects are scored in terms of the quality of effort and the relative value to DoD. These findings are used by the negotiators, along with business factors, in arriving at settlements.

The Service negotiator reviews contractor IR&D/B&P costs, company sales, percent of Government business, and other financial data for prior years and compares these with current proposals. He also reviews the technical evaluation and compares it with previous evaluations. These factors when combined form the basis for a negotiation range, which is then used in direct negotiations with company representatives to arrive at the advance agreement.

If the parties fail to agree before the end of the contractor's fiscal year, the DoD negotiator will issue a final determination establishing a ceiling for IR&D/B&P that does not exceed 75 percent of the amount that would otherwise have been offered.

The contractor may appeal a final decision of the negotiator to a special appeals group of the Military Department as provided by Section 203 of PL 91-441.

Senator Stevens: Are funds being requested in this budget to seek means of shortening lead times on critical items such as the more sophisticated electronic chip requirements, lens coatings for night sights, certain components of turbine engines and other long lead time items?

Dr. Wade: Yes. Among research and development efforts which will reduce lead times are: improved electronic materials and processes for infrared arrays to overcome current lead time deficiencies for tank thermal weapons sights and missile seekers; expanded production capability for optical rods used for laser designators and range finders employed in target acquisition equipment; development and use of composite materials to simplify manufacturing of complex, highly stressed structures in aircraft missiles and turbine components; exploration of the application of diffusion bonded titanium to replace complex steel forgings for aircraft landing gear struts; exploratory development on drugs and vaccines unique to DoD in order to reduce typically long development cycles; development of approaches, via the Very High Speed Integrated Circuit Program, for the determination of signal processing commonality. This can be the basis for chip designs (the time and cost drivers) which can be used across various types of military systems; and development of advanced software technology concepts to simplify and facilitate future embedded computer software developments.

Manufacturing technology programs which will improve lead times include: interactive graphics techniques coupled with finite element stress analysis to reduce gear die design time; powder metallurgy closed die "near net shape" forging of cannon components; computer based techniques for inspecting turbine blades during fabrication and overhaul; automated assembly of integrated circuit boards; thick section laser welding of missile and missile launching components; and machine lay up of high curvature aircraft composite structures and skins.

Senator Stevens: In the fiscal year 1981 Appropriations bill the conferees agreed that the Research and Development accounts could absorb a part of the funds requested for inflation. How does the Defense Department plan to effect that absorption?

Answer: The absorption of the reduction in the funds requested for inflation will be spread across-the-board against the hundreds of projects where inflation adjustments were allowed. Details of these reductions are available in the FY 81 Supplemental and FY 82 Amendment program element listings.

Senator Stevens: The Secretary of Defense recently released information concerning savings for fiscal year 1981 and fiscal year 1982. In the summary of these savings there were certain Research and Development activities listed. What impact will these reductions have on Research and Development and what plans, if any, does the Defense Department have for additional savings in the R&D accounts?

Answer: Savings other than those relating to inflation in FY 81 were accomplished across the board organizationally in the R&D

community by reductions in travel, consulting and related services, effects of the temporary civilian hiring freeze, deferral of procurement of non-mission essential equipment and implementation of audity agency recommendations. The reductions were applied in relatively small increments to the many organizational activities associated with the R&D program and therefore the impact is minimal. The Defense Department intends to examine these activities continually in depth as time and manpower allow during the coming months.

Savings in FY 82 were follow-on actions to the above plus reductions and eliminations of marginal projects and programs.

Senator Stevens: Are Research and Development funds being requested in connection with the reactivation of the battleships NEW JERSEY and IOWA and the aircraft carrier ORISKANY?

Answer: R&D funds are being requested in the FY 81 Supplemental for the ORISKANY ($7.0M), NEW JERSEY ($2.0) and IOWA ($1.0M). Follow-on amounts in FY 82 are ORISKANY ($8.0M), NEW JERSEY ($2.0M) and IOWA ($2.0M).

Senator Stevens: What level of funding is requested for Ballistic Missile Defense for fiscal year 1982?

Dr. Wade: With the amendment that was submitted on March 4, 1981, which included $85.9 million for the acceleration of the Low Altitude Defense (LoAD) preprototype demonstration, the total fiscal year 1982 funding for Ballistic Missile Defense is $428.6 million.

Senator Stevens: How much has been spent on Ballistic Missile Defense since the SAFEGUARD ABM was terminated, including the estimated expenditures of funds appropriated for fiscal year 1982?

Dr. Wade: The SAFEGUARD system was terminated in FY 1975. From FY 1975 through FY 1982 a total of about $2.1 billion will have been spent on Ballistic Missile Defense technology, $900 million on Advanced Technology and $1.2 billion on Systems Technology, including the FY 1981 supplemental request of $36.2 million and the FY 1982 request.

Senator Stevens: Are additional funds requested for fiscal year 1982 in regard to the development of the LoADs and exoatmospheric systems?

Dr. Wade: The FY 1982 budget request includes funding for both the LoAD preprototype demonstration and for the development of exoatmospheric defenses. The FY 1982 amendment does not include any additional funds for exoatmospheric systems, the amendment is to accelerate the LoAD program.

QUESTIONS SUBMITTED BY SENATOR HATFIELD

Excessive Standards and Specifications

Senator Hatfield: How do you perceive the seriousness and scope of problems of excessive performance standards and military specifications as related to the research-development and testing/evaluation phases of weapon systems acquisitions?

Answer: The Department of Defense recognizes that uncontrolled application of military specifications and standards can result in excessive design requirements, management systems, and associated costs during all phases of the acquisition process. The April 1977 Defense Science Board Report entitled "Report of the Task Force on Specifications and Standards" contended that problems with specifications and standards arose more from a tendency to overdo both application and enforcement rather than from detailed content of the documents themselves. Accordingly, in 1979 the Department of Defense issued DoD Directive 4120.21, "Specifications and Standards Application," establishing policies mandating selective application and tailoring of these documents. These policies were updated and reissued on 3 November 1980. Strong justification and controls required to include portions of standardization documents coupled with the encouragement of a positive dialogue between government program offices and their industry counterparts serve to foster economy through the intelligent and appropriate application of military standardization documents. Contractor participation (through identification of potentially excessive requirements and proposal of alternatives) is one key to the success of the program. Selected system acquisition reviews, feedback from industry associations, and results of joint government/industry seminars on the subject indicate that the program is effective in controlling costs and that substantial progress is being made in developing optimum requirements statements for defense acquisitions.

RDT&E Performance Criteria

Senator Hatfield: What procedures do you plan to follow or emphasize in trying to bring RDT&E performance criteria more into line with actual combat realities? In your experience, what seems to have worked best in this regard?

Answer: The key to bringing RDT&E performance criteria in line with combat realities has been to obtain early and direct user participation in the requirements determination process. This participation must carry over into subsequent phases of the acquisition cycle, including the design phase. User representation in the Program Management Office and other developmental agencies has also proven beneficial.

It is uneconomical, if not impractical, to accommodate major design changes to satisfy the user's operational needs after the design has been finalized and released for prototype manufacture. The design community needs to know which operational features are mandatory to effective operation and support, which ones are of lesser importance, and which ones are only worth pursuing if there is no significant impact on cost and schedule.

Operational test feedback from the validation and demonstration phase on forward is vital. The Department has undertaken a full examination of the acquisition cycle with the objective of implementing streamlining measures and other efficiencies. We are looking in the direction of conducting operational testing earlier in development, and buying more test articles so we can expedite the entire T&E process.

Other techniques to bring about a closer user-developer interface and exchange of ideas have proven useful, such as field trips by those responsible for the design phase, in particular by contractor design teams, R&D conducted briefings on new technical developments, and user sponsored presentations on his current operational needs and deficiencies with existing equipment.

Product and Component Civilianization

Senator Hatfield: What are the prospects for making greater use of civilian products and components in military systems, and what would be the instrumentalities for achieving such a civilianization of the weapon acquisition process?

Answer: The prospects for utilizing the capabilities of the commercial market place are greater now than in the past. DoD is actively pursuing the use of acceptable commercial equipment at the system, subsystem, component, support, and materiel levels as the preferred alternative to designing and acquiring unique military products. Emphasis on the increased application of commercial products, their subsequent distribution and support systems formally began in September 1978 with issuance of DoD Directive 5000.37, "Acquisition and Distribution of Commercial Products (ADCoP)." This directive requires defense agencies to consider off-the-shelf or modified off-the-shelf commercial equipment and services whenever they can meet DoD needs. A guidelines manual for acquisition and support managers on optimizing use of the commercial market place is in the final stages of preparation. Defense Acquisition Circular 76-18 suspended the mandatory use of Military and Federal Specifications for the acquisition of commercial products. In December 1979, the Commercial Item Description (CID) was instituted in the Defense Standardization and Specification Program as a simplified means for defining available commercial products known to meet defense requirements. Existing specifications and standards prepared by the Defense Department are currently undergoing a special review to either eliminate nonessential military-unique provisions or convert the documents to a CID.

Overspecification and High Performance Standards

Senator Hatfield: What do you consider to be some of the most serious examples of overspecification and unnecessarily high performance standards in defense acquisition programs?

Answer: The Department of Defense does not knowingly create or perpetuate excessive or unrealistic requirements in military specifications and standards which exceed the level of performance required for operational purposes. We are, however, concerned that certain of our standardization documents have the potential of being "cost drivers" if not properly reviewed, justified, tailored, and applied. These documents establish general requirements (such as quality, reliability, etc.) applicable to a broad range of systems and equipment, and are classified and managed in standardization areas as opposed to federal supply classes. For each procurement, such documents receive particular attention in the application and tailoring process as discussed earlier. Another program is in use to provide increased standardization resources to manage and maintain these documents. Our objective is to restructure these documents in a manner which encourages--and in many cases forces--selective application and tailoring of requirements contained therein. Extensive application guidance now being provided in our standards tells the user (government and industry) of the intent and appropriateness of requirements.

Production Base

Senator Hatfield: There is a growing awareness of fundamental problems of low productivity in U.S. industry at large, a shrinking defense production base, and limited competition among a declining number of sub-contractors producing the bits and pieces that go into major weapon systems. How do you evaluate these factors and how might they be alleviated to achieve more cost-effective defense production?

Answer: The situation is extremely complex with no single solution. The problems of the defense industry are, to a large extent, a subset of our overall economic industrial problems. The Department of Defense approach to the problem is therefore consistent with, and should be seen in the light of, the President's overall program to revitalize our economy and strengthen our national defense. The need to increase productivity and to improve the defense industrial base requires a number of actions by the Federal Government. Tax provisions, depreciation schedules, environmental restrictions, Socio-economic objectives as they relate to U.S. industry need to be evaluated in terms of optimum overall value to the Country. We believe that the Department of Defense needs to use more multiyear contracts to add stability to the contracting process thus increasing incentives for capital investments. This is a particular area where Congressional support, particularly from the appropriations Committee, is needed. As a key component of our overall effort in these areas, we are identifying and assessing options for major improvements in the acquisition process to reduce acquisition costs, acquisition time, and increase program stability. The increases in the FY 81 and FY 82 budgets will make a significant contribution to more efficient production and measurably improve readiness.

Defense Industrial Base

Senator Hatfield: Former Under Secretary Bill Perry has characterized the current condition of the U.S. defense industrial base as "unbalanced" and in need of "revitalization." This is similar to the past comments of Air Force General Alton Slay. How do you feel about these charges?

Answer: The characterization by the former Under Secretary remains fundamentally correct. The testimony by General Alton Slay was most complete in assessing the complexity of the industrial base problems and in outlining improvement actions with which I generally agree.

Subcontractor Deficiencies

Senator Hatfield: These comments have indicated that sufficient capacity exists at the prime contractor level to support defense programs but the main deficiencies are at the subcontractor and vendor levels. How would you recommend these deficiencies be overcome?

Answer: The increases in the FY 81 and FY 82 budgets should have a measurable impact on revitalizing the defense supporting industries. The primary focus, however, must be on providing the proper incentives to improve deficiencies in the subcontractor base. The sub-tier base has been hard hit by ambitious rule-making and government regulations which has turned them away from defense business. In many instances the benefits available to the prime producers are not passed on to the subcontractor or supplier. We see the need to increase productivity and rebuild our industrial base, requiring changes in depreciation schedules and other measures to enable and encourage industry to invest in modern plants and equipment. Other financial improvements are being considered such as increased use of milestone billings and advance funding and expediting the government payment cycle. There is no single solution, however, we believe that efforts to stabilize acquisition programs through more selective use of multi-year contracting will permit contractors to purchase materials and produce components for end items more economically. Overall, these measures--plus others--should help to overcome the deficiencies which exist.

QUESTIONS SUBMITTED BY SENATOR SCHMITT

ECM and EMP Testing of B-1

Senator Schmitt: Has the Air Force or will the Air Force ever test B-1 Aircraft 4 on ECM and EMP?

Answer: Since Aircraft 4's first flight on 14 February 1979, this aircraft has been the primary testbed for the Bomber Penetration Evaluation program. This evaluation is designed to provide empirical data on the B-1's capability to penetrate projected Soviet air defenses. Evaluation of the ALQ-161, the B-1's defensive suite, will continue through 30 April 1981. This flight test emphasizes the evaluation of the defensive avionics system in an operational environment.

Aircraft 4 was scheduled to undergo an electromagnetic assessment to include dipole and trestle testing in both FY 81 and FY 82. That testing was eliminated when the program was cancelled and funding reductions caused reprioritization of Bomber Penetration Evaluation objectives.

Trestle Test of B-1 Aircraft #4

Senator Schmitt: In view of the decision to seek a new bomber would not there be value in conducting a trestle test of B-1 aircraft #4 for use in the design of the new bomber?

Answer: Trestle tests of aircraft such as the B-1 aircraft #4 would most likely add to the existing technical data base supporting the design of EMP hardened aircraft. However, the conduct of trestle tests on B-1 #4 is not advisable in the near term for the following reasons:

o B-1 #4 is currently a developmental configured aircraft. For example, the ALQ 161, defensive suite, functions only in the forward right quadrant. It would be much more useful to perform trestle tests on a more operationally configured aircraft, as is the projected plan if the B-1 or a B-1 variant is selected as the new bomber.

o A commitment of B-1 #4, at this time, to modifications required for its use in trestle testing could make it unavailable for other critical development testing early in the new bomber program. Until the decision on the new bomber configuration is made, B-1 #4 should be maintained as a prime candidate for modification and use in early development testing to support an accelerated new bomber program.

QUESTIONS SUBMITTED BY SENATOR STENNIS

NEW MANNED BOMBER

Senator Stennis: General Ellis, the Commander of the Strategic Air Command, has recommended a two bomber plan whereby a relatively near term IOC aircraft could be fielded in 1985 or 1986 and then an advanced technology aircraft could be developed for introduction in the late 1980s or early 1990s. Does the funding of $2.4 billion in fiscal year 1982 protect all options that are currently being considered?

Dr. Wade: The $2.4 billion in fiscal year 1982 protects any single bomber option. For multiple bomber options such as a current

technology aircraft like an FB-111B/C with an IOC of 1985 or a B-1 with an IOC of 1986, and, in parallel, an advanced technology aircraft, the required funding level could be higher and would depend upon the desired IOC for the advanced technology aircraft. For example, if an early IOC for the advanced aircraft is desired and a B-1 Variant were chosen as the near term IOC aircraft additional FY82 funds would be required. More significant funding levels for a two bomber option involve FY83 and later years. These considerations are being addressed during the ongoing bomber study and will be presented to Congress after final costs are available on 1 June 1981.

NEW MANNED BOMBER

Senator Stennis: If the decision is to go to an advanced manned bomber with an IOC of 1986, is there sufficient industrial capability to produce the four aircraft per month by 1985 that is envisioned in the FY 1982 budget amendment?

Dr. Wade: There is sufficient industrial capacity to build advanced manned bomber aircraft such as the FB-111B/C, B-1 Variant or new technology aircraft at the rate of four per month. Availability of critical materials such as titanium will pace the schedules. Given adequate industrial priority ratings such as DX (Brickbat), IOC and monthly rates can be achieved. Sufficient priority ratings are being requested to maintain monthly production rates and IOCs.

Multi-year Contracting

Senator Stennis: How do you feel about the merits of using multi-year contracting to encourage private industry to invest more in productivity-enhancing equipment? A number of authorities feel this would lend stability to the defense market place.

Answer: Multi-year contracting offers the opportunity to enhance productivity and achieve outyear cost savings in production programs. A long term Government commitment for those programs selected for this contracting technique would add immeasurably to stability in the defense market place. Several candidate programs have been identified for possible multi-year application. Upon completion of our reviews and selection of those programs best suited for multi-year procurement, Congressional approval will be sought.

F/A-18 Production Rate

Senator Stennis: The Navy is requesting additional funds to increase the production rate of F-18 aircraft. Are you satisfied that the past deficiencies encountered in the testing of this aircraft have been corrected and now is the proper time to increase the production rate?

Dr. Wade: Based on the DSARC review in November 1980 and another held on 17 March 1981, the development of the F/A-18 appears to be proceeding satisfactorily. Technical deficiencies discovered early in the test program have been corrected and tested. Deficiencies, which caused the loss of an aircraft, have been essentially corrected; however, some testing remains. Testing now under way gives us confidence that these problems can be solved with low risk. The performance requirements for the fighter configuration have been essentially met and we have no indication at this time of significant problems with the attack configuration.

Our experience thus far indicates that the reliability of the F/A-18 in operational service will set new standards for tactical aircraft. Even though the F/A-18 is not fully mature, its reliability exceeds that of our operational fleet aircraft. Procurement will be continued to the extent it is authorized by the Congress and concurred in by the Department of Defense prior to the full DSARC III in September 1982. I am satisfied that this is the proper time to increase the production level to the 60 aircraft per year requested by the Navy for FY 81 and authorized by the Congress. Within the appropriated funds, it is only possible to procure and support 53 vice the authorized 60 aircraft in FY 81. Therefore, we support the request for supplemental funds to buy the 7 extra aircraft.

U.S. INTENT ON JP-233

Senator Stennis. I note the FY 1982 budget amendment requests $66 million in FY 1981 and $60 million in FY 1982 for continued development of the joint U.S./British JP-233 low altitude airfield attack system. The House Appropriations Committee was insistent during conference deliberations on the fiscal year 1981 Defense bill that U.S. participation in further development efforts of this system be terminated. What has changed in this program since the fiscal year 1981 bill was enacted so as to overcome the objections of the House?

Dr. Wade. Nothing has changed in the JP-233 program. The DoD continues to support the program because (1) the USAF lacks an airfield attack capability; (2) we have already invested heavily in the program, and development has matured to the point where termination costs represent approximately 21% of the funds required to complete development; and (3) the program is a keystone in our arms cooperation efforts with the UK.

COMPARISON OF RUNWAY CRATERING SUBMUNITIONS

Senator Stennis: Isn't it true that there are a number of other potential airfield attack systems that are being developed? Would you describe these other systems and assess the capability of each in relation to the potential of the JP-233 system.

Dr. Wade: Yes. There are two other airfield attack systems in development: the German STREBO and the U.S.-developed Medium Range Air-to-Surface Missile (MRASM). The STREBO and JP-233 are similar in concept in that both are aircraft-delivered, direct airfield attack systems, with cratering and area denial submunitions. The STREBO's cratering submunition (STABO) is somewhat smaller than the JP-233 cratering submunition (SG-357). Although a larger number of STABOs than SG-357s can be carried on a single sortie, STABO with less destructive force than SG-357 will cause smaller craters. Both JP-233 and STREBO are in full scale development with JP-233 ahead somewhat in development schedule.

The airfield attack submunition for the standoff MRASM is the Lawrence Livermore Laboratory's VAM-93 which is also in full scale development. The VAM-93 is approximately one-third the weight of JP-233's SG-357; the craters caused by VAM-93 are expected to be significantly smaller than STABO and SG-357 craters.

In addition to these airfield attack systems, we are evaluating several airfield attack munitions. Some of the potential alternatives to the JP-233 cratering submunition such as the Canadian CRV-7 and the French BAP-100 have not been found suitable for USAF use; others require additional testing. The French DURANDAL, for example, has recently been tested at Eglin Air Force base; we plan to complete additional tests later this year.

We are continuing to study the precise tradeoffs in capabilities (crater size, spacing, and runway repair time), methods of delivery (standoff MRASM, JP-233 across the runway, and STREBO down the runway) and cost effectiveness (including attrition factors) between direct attack and standoff airfield attack weapon systems.

Lightweight Armored Vehicles

Senator Stennis: The fiscal year 1981 bill includes limited funding for procurement and testing of lightweight armored vehicles for the Army and Marines. What is your opinion of the outlook for these vehicles?

Dr. Wade: The USMC and the US Army have evolved operational concepts and organizational concepts in which certain of our light forces would need to be equipped with lightweight, mobile, protected weapons. However, only the Marine Corps had funding in FY81. No system currently exists which would fully meet the needs as they are being envisioned by the USMC or the Army. On the other hand, both Services believe the need to be so urgent that it would be unwise to await development of a new system. Therefore, they propose to acquire a near-term capability by procurement of "off-the-shelf" systems, with some modifications to accommodate various weapons.

The operations envisioned by the MC and the Army have many common aspects, but some improtantly different aspects. In consequence, many of the characteristics of the systems envisioned by the two Services are quite similar, but some important ones are different.

The near-term vehicle is called the Light Armored Vehicle (LAV) by the Marine Corps and the Mobile Protected Gun - Near Term (MPG-N) by the Army.

The primary requirement is for a readily transportable, mobile system capable of delivering fire against personnel, material, and lightly armored targets while providing maximum protection for the vehicle and occupants against small arms fire and suppressive artillery fire.

The Army and Marine Corps will probably adapt the basic vehicle to other missions provided industry can offer an acceptable vehicle in the near-term.

One vehicle variant for both services is planned to be wheeled, armored and most probably equipped with the 25mm BUSHMASTER automatic chain gun. OSD has sought to insure that Service operational needs be correctly articulated, both where similar and different, and has encouraged the Army and Marine Corps to establish a joint Services program to acquire systems for use in the near-term. The Army and Marine Corps are continuing negotiations to hopefully evolve a joint near-term procurement program.

JP-233 DSARC

Senator Stennis: The Comptroller General recently had some adverse comments relative to the JP-233 development procedures. Will these procedures be revised to ensure that a production decision will not be made until approval by the Defense Systems Acquisition Review Council (DSARC)?

Answer: The Congress denied the $56.5M for JP-233 that Air Force had requested for FY 81 and the U.S. participation in the UK development of JP-233 is currently in the final stages of termination.

Therefore, there are no current plans to schedule a DSARC review of JP-233. However, the budget amendments contain $66M in FY 81 and $60M in FY 82 to restart U.S. participation. If this restart request is granted, the DSARC would review the program prior to resumption of the U.S. participation in the UK development. The DSARC would also conduct a normal Milestone III review prior to production and deployment.

To date, there have been no DSARC reviews of the JP-233 program because the memo of understanding gave the UK full management responsibility and the Air Force has no money budgeted for procurement of JP-233.

AAH VERTICAL RATE OF CLIMB

Senator Stennis: The AH-64 attack helicopter continues to have excessive weight which prevents it from achieving required vertical rate of climb requirements. Is it your opinion that the excess weight can be reduced or will more powerful engines be required?

Dr. Wade: Current prototypes in the development program are too heavy to allow them to achieve the required vertical rate of climb. The ongoing weight reduction program for the Advanced Attack Helicopter (AAH) has identified measures which could result in a production aircraft that would achieve the minimum vertical rate-of-climb requirement. Earlier this year, however, the Army determined that the more powerful T700-GE-701 engine, an outgrowth of the -700, is ready to be incorporated into the initial production AAHs to achieve greater reliability, increased mission capability and enhanced survivability. This engine will allow an increase in the useful load of approximately 700 pounds while maintaining the required vertical rate of climb or, conversely, allow the aircraft to far exceed the VROC performance at its primary mission gross weight. While we shall continue to pursue the weight reduction program, the cost effectiveness of each proposed tradeoff will be reviewed in light of this more powerful engine.

TARGET ACQUISITION DESIGNATION SIGHT

Senator Stennis: How about the target acquisition and designation sight? There have been design modifications, but testing is not complete. Have you confidence that the requirements can be met with the modifications?

Dr. Wade: Several TADS design modifications were determined necessary at the conclusion of the competitive development phase testing. Most of these shortcomings have been corrected and corrections demonstrated in the follow-on maturity phase hardware. The contractor has encountered some redesign problems in assembly and operation of the maturity phase hardware, however, progress is being made and performance is improving at a satisfactory pace. Testing will continue during the period between now and the AAH Operational Test II and it is expected that TADS will be ready to perform its mission at that time.

AAH VIBRATION LEVEL

Senator Stennis: How about the greater than desired vibration levels? Does there continue to be hope that this can be reduced?

Dr. Wade: Instrumented vibration survey shows that vibration levels in the prototype vehicle which most closely represents the production configuration exceeds the specifications. These levels do not, however, exhibit adverse impact on crew proficiency. Reports from operational crews indicate that vibration characteristics of the AAH are totally acceptable in all simulated combat mission environments. There is no indication that a pilot cannot remain proficient for 8-10 hours of flight in the aircraft. We shall, however, continue investigation of this matter throughout the development program. While vibration absorbers have been fabricated and flight tested which lower the vibration levels in the pilot station to levels below those specified, operational Test (OT II) will be flown without these absorbers and the decision to incorporate them in the production configuration will be made after that, based on OT II and developmental test results as well as cost and weight considerations.

TRIDENT II Missile

Senator Stennis: Where do we stand on development and deployment of the new TRIDENT II (D-5) missile? Do we develop a new missile or merely extend the accuracy and range of the current TRIDENT I (C-4) missile?

Dr. Wade: In October 1980, the Navy, at the direction of the Secretary of Defense, initiated a three year Advanced Development Program in order to select an SLBM modernization prior to October 1983 to support an Initial Operational Capability of 1989. The intent of this advanced development effort is to assess thoroughly the various weapon system improvement design alternatives (specifically in the areas of accuracy, range and payload), and to select the option which can best satisfy our strategic requirements. The options under consideration are:

o Modification of the TRIDENT I Weapon System to improve system accuracy (Improved Accuracy C-4) to a goal of (deleted) Circular Error Probably (CEP) at 4000 nautical miles.

o Modification of the TRIDENT I Weapon System to improve system accuracy to a goal of (deleted) CEP at 4000 nautical miles and increase the range but not the payload (Long C-4).

o Modification of the TRIDENT I Weapon System to improve system accuracy, increase range and increase payload (TRIDENT II); an accuracy goal of (deleted) nautical miles with improved range payload capabilities.

Prior to the end of fiscal year 1983, a Defense System Acquisition Review Council (DSARC II) is planned for the purpose of selecting one of these options.

Execution of this program is dependent on prompt approval by the Congress of a $32.9M reprogramming action (DOD serial number FY81-17 PA) now pending before the Congress.

TRIDENT II Missile

Senator Stennis: Is affordability an issue here? Some sources believe it would cost about $8 billion to develop the new missile. How would this cost compare with improvements to the C-4 missile?

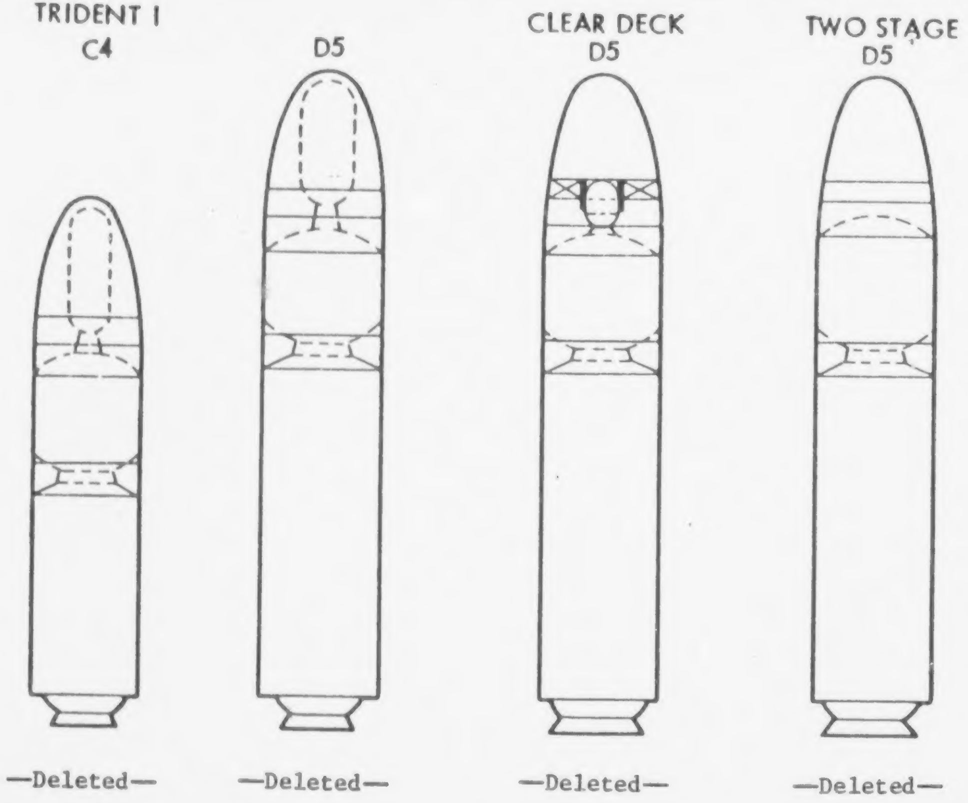
Dr. Wade: Affordability, as well as submarine survivability and mission capability, is a primary consideration in selecting a force modernization weapon system option. One of the reasons for a force modernization effort is to minimize total weapon system costs by maximizing the range/payload capability of a missile designed to fill the TRIDENT launch tube envelope, thereby allowing mission capability to be achieved with a lesser number of submarines. It is estimated that the total weapon system development costs for the TRIDENT II missile system (improved accuracy, greater range, increased payload) is approximately $8 to $9 billion. The cost of simply upgrading the accuracy of C-4 is estimated to be between $3 and $4 billion. All estimates are in fiscal year 1981 dollars. With respect to the specific issue of affordability, one must consider all costs, not just R&D, along with the need to balance the TRIAD to achieve and maintain an effective nuclear deterrent capability.

TRIDENT II Missile

Senator Stennis: What is the estimated quantum increase which the D-5 is projected to provide over the C-4 in terms of payload and range?

Dr. Wade: The TRIDENT I (C4) is capable of delivering (deleted) MK4 reentry bodies to approximately —D— nautical miles. The Navy is presently considering several versions of a TRIDENT II (D5) missile with an objective of maximizing the range payload performance characteristics within the confines of the TRIDENT launch tube envelope. The attached table provides a range of estimates for various D-5 options compared to C-4. At a minimum, and based upon the technologies being pursued in the Advanced Development Program, it is estimated that the TRIDENT II (D5) missile will be capable of delivering -D- MK4 reentry bodies to a range in excess of (deleted) nautical miles. It should be noted further that the TRIDENT II (D5) could provide the additional capability (deleted).

MISSILE OPTIONS (U)


TRIDENT I
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C-X

Senator Stennis: Over $250 million is requested in FY 1982 for continued development of the C-X airlift aircraft, yet the program as currently structured does nothing for the near term improvement in airlift capability. Just what options are available for near term improvement?

Dr. Wade: The Air Force is currently evaluating alternative potential solutions to the need for additional airlift. These alternatives include enhancements to the Civil Reserve Air Fleet (CRAF) program, the procurement of commercial wide-bodied aircraft or derivatives thereof, and procurement of military airlifters (new designs and derivatives of existing military airlifters). After the Air Force has completed their analysis and evaluation, their recommendation as to whether to procure derivative aircraft, new aircraft, or a mix thereof, will be presented to the Secretary of Defense for his approval.

The CRAF program and the acquisition of derivatives (or unmodified) commercial aircraft provide the earliest opportunity to improve airlift capability.

Senator Stennis: In the past, strategic airlift efforts were considered too expensive to risk near the combat zone. If this is so, why does the C-X include intra-theater airlift as a secondary role in its justification?

Dr. Wade: Strategic airlift assets, as in the past, would not routinely be operated into any area that was not adequately protected.

Senator Stennis: What is being done to meet the stated shortfall in theater airlift capability?

Dr. Wade: A strategic airlifter capable of operating into small austere airfields would be used to supplement current in-theater capability.

Senator Stennis: To date DOD has spent about $1.5 billion to develop high energy laser weapon systems. The majority of authorities believe we are at least five years and over $1 billion away from deciding whether to prototype the first high energy laser weapon. Dr. Fossum, do you agree with this assessment?

Dr. Fossum: I will respond to this question in the context of the space-based laser. The answer to this question with respect to less demanding applications in the tactical arena will not be treated in my response. I believe that (deleted). This program is (deleted). In such a program, (deleted).

Such a program would be structured with milestones to permit a continuing assessment of programs before major new commitments of resources. It would cost approximately (deleted). I should note that all cost estimates are in constant FY 1981 dollars.

The program would contain four major thrusts:

- A technical feasibility demonstration (deleted).
- A comprehensive analysis and testing program to (deleted).
- (Deleted).
- An aggressive technology development effort to provide (deleted).

Senator Stennis: Over the years program direction has been spread by the individual military services and DARPA -- with each pursuing mission applications of their own interest. What do you think of this practice? Wouldn't it have been more efficient to have a clear, definitive Defense direction or centralized approach for these programs?

Dr. Fossum: With some reservations I would judge that the organizational structure and division of responsibilities we have today fits the program we have today. Heavy Service involvement in the tactical programs is consistent with the need to have the ultimate user closely associated with the development of a weapon which will either replace or supplement other weapons they have in their inventories.

The concentration of the space-based laser program in DARPA some five years ago was consistent with the DARPA charter to seek high payoffs from high risk programs. As the program has matured, there has been no [deleted]. Normally, as the space laser program grows and picks up momentum, we would expect increased involvement by a designated Service with a transition period where the majority of the resources gradually shift to the Service. If, however, [deleted]. Then I would advocate that the program management structure be [deleted]. I think our experience in such areas as ballistic missile defense argues for that approach. A highly motivated, single organization dedicated to a specific and somewhat limited goal and the resources to achieve that goal are the keys to being successful in [deleted].

Senator Stennis: The Defense Science Board recommended the centralized approach. Why does Defense object to implementing the Board's recommendation?

Dr. Fossum: The management recommendations of the Defense Science Board Task Force would have effectively taken the management of the Services' high energy laser program out of their hands and placed it in the hands of a centralized management conducted by the Office of the Secretary of Defense and the Defense Advanced Research Projects Agency. Management actions of this sort invariably tend to reduce Service enthusiasm for programs and reduce the Service participation necessary for eventual transition from a technology program to a weapon system program. In view of the drawbacks of the management recommendations made by the Defense Science Board Task Force, we do not plan to implement them. Many of the programmatic recommendations (to add, delete, or change the thrust of individual work elements) of the Defense Science Board have been implemented.

Senator Stennis: Would you say that the high energy laser program is the largest single technology base program currently under way?

Dr. Fossum: The Department of Defense considers the high energy laser program as the largest single technology base program it has underway.

Senator Stennis: On this basis what management changes could you recommend to enhance control of the various high energy laser programs?

Dr. Fossum: No management changes have been made since the Defense Science Board Task Force published its report. None are presently under consideration.

Senator Stennis: Is it possible under the present system for decisions to be made for a specific weapon application or for the general feasibility of a high energy laser weapon?

Dr. Fossum: Yes. Specific dates will depend upon the particular application, the level of effort applied to technology development, and the degree of success achieved. Except perhaps for the [deleted]. However, the Army is just starting a demonstrator program, and prototyping is several years away.

Senator Stennis: In the event of a pressing national threat such as deployment of a Soviet high energy laser -- and assuming adequate resources -- how soon could prototype decision be made relative to our program?

D. Fossum: It is not clear that Soviet deployment of a high energy laser system would create a pressing need for the US to develop countermeasures to the Soviet high energy system, which might consist of [deleted].

Acceleration of any program is a matter which requires a significant effort by a study task force before meaningful estimates can be made. The Department of Defense is presently conducting such a study with respect to space laser weapons at the request of the Senate Armed Services Committee (FY 1981 Committee Report, page 90). It is planned for the report to be delivered to the Congress in mid-May.

Senator Stennis: In the same context and assuming continuation of present management, how many years and dollars will it take to deploy a high energy weapon system?

Dr. Fossum: This depends upon the specific application chosen. The earliest potential application is perhaps the [deleted]. If a decision were made that a requirement exists for such a weapon, a [deleted] with the demonstrator having a significant operational capability after its demonstration were complete. The cost would be dependent upon the capabilities chosen for the demonstration. A [deleted] would be required for reasonable operational coverage.

Senator Stennis: Does the Office of the Secretary of Defense periodically review the status of the entire high energy laser technolgoy program to determine how best to meet national security needs? If not, then why is this item not reviewed?

Dr. Fossum: The Office of the Secretary of Defense frequently reviews the status of the entire high energy laser technology program, as part of the general management of the budget, and through special reviews such as the Defense Science Board Task Force and the High Energy Laser Review Group (HELRG). The HELRG is a panel including the HEL project managers in the Services and DARPA, and three non-DOD consultants, chaired by the Director, Directed Energy Programs, OUSDRE. It meets quarterly to review selected aspects of the DOD high energy laser program.

With respect to technology assessment analyses, the Services have individually conducted the appropriate analyses, and there is little to be gained from an OSD level restudy. It would simply reproduce the Service' results, gathering them into a single report. Recent examples of Service studies are the Army's "Army Laser Weapon Technology Assessment" (ALAWTA) study and the Air Force's "High Energy Laser Technology Assessment" (HELTAS) study. The Navy has conducted a similar study.

Senator Stennis: Is it your opinion that the various services and DARPA are actually pursuing an entire class of high energy weaponry without first having an adequate technology base.

Dr. Fossum: The DOD is developing the technology base for an entire class of high energy laser weaponry. It is not presently possible to predict with confidence which potential application of the high energy laser will be the first fielded weapon system.

Senator Stennis. The budget amendment for fiscal year 1982 includes $42 million to upgrade Korean forces equipment. This seems like a strange mission for DARPA. How do you plan to implement this?

Answer: This program was requested by Commander in Chief, U.S. Forces Korea (GEN Wickham) and the Commander in Chief, Pacific Command (ADM Long) as an activity that could significantly increase U.S. forces capability within Korea and could be applicable to other forces within the Pacific Command. [Deleted].

Equipments would be built and tested in CONUS and then deployed with support packages for testing within Korea. Tests in Korea would be done in conjunction with allied field training exercises. Equipment which tested successfully in Korea would then be nominated for acquisition.

Senator Stennis: What has changed in the Particle Beam Program to require the additional $17 million which is requested in the FY 1982 budget amendment?

Dr. Fossum: In response to Congressional guidance, which was expressed formally in the DoD Authorization Act for FY 1981, DOD has instituted the Particle Beam Technology Program. This is a consolidated program which combines efforts by DARPA and the Military Departments, under the overall technical direction of DARPA, with the objective of determining the feasibility of particle beam concepts [deleted].

Under this program DARPA has the responsibility for performing feasibility experiments for both charged and neutral particle beam concepts. The Military Departments have responsibility for developing the technology base required to implement particle beam concepts once feasibility is demonstrated. Charged particle beams have potential applications for anti-ship missile and endoatmospheric ballistic missile defense. DARPA-sponsored research in this area, which has previously addressed only the [deleted].

The additional $17 million, which is requested in the FY 1982 budget amendment, is essential in order to continue with the expanded scope of the consolidated program which was initiated in FY 1981. Without these funds [deleted].

Senator Stennis: What is DARPA doing in the area of very large scale integrated circuit systems (VLSI)?

Dr. Fossum: The DARPA research program in Very Large Scale Integration (VLSI) contains efforts in both the information processing and material science areas. In the information processing area the research is focussed on developing design methodologies, concepts for advanced computer aided design and innovative architectures for VLSI. Design system concepts are being developed which permit the designer to start with a high-level description of the chip architecture, refine his design interactively with a computer, develop test procedures interactively, and finally rely on the computer to create a suitable layout on the material substrate. Chips are being designed and fabricated to explore innovative architectures, including highly parallel structures, restructurable logic and new architectures for advanced computation.

In the material science area the research is focussed on providing fundamental scientific insight into critical materials and processing phenomena, and on exploration of feasibility of new and innovative materials or materials systems, device structures, and fabrication techniques. These will provide entirely new and/or much more efficient capabilities to fabricate performance-intensive and complex VLSI structures. Research efforts are providing insight into the physical processes used in fabrication of devices having extremely small features (less than 1 micron), and developing models of them so that the processes can be simulated and optimized rapidly using computers. Emphasis also is on evaluation of new materials and device structures which have particular promise to provide VLSI-level computational complexity in tne extremes of military systems environments: radiation tolerance, temperature range of operation, power dissapation, weight and volume.

A fast turnaround fabrication capability is being established to reduce the time required to fabricate and test a custom or innovative chip design. An ultimate goal of this program is to be able to design and fabricate chips containing a million or more logic gates with fast turnaround.

Senator Stennis: What is in the budgets for fiscal years 1981 and 1982 for this type studies and what has been expended in the past?

Dr. Fossum:

	Prior Years	FY 81	FY 82
VLSI Design and Architecture	$8.1M	$10.1M	$12.5M
VLSI Materials and Processing	$20.0M	$10.2M	$11.3M

Senator Stennis: DARPA apparently is involved with programs of this nature at six universities. What universities are involved and will this effort be expanded?

Dr. Fossum: There are six major universities participating in the design and architecture portion of the VLSI program.

They are:

Massachusetts Institute of Technology
Stanford University
Carnegie Mellon University
California Institute of Technology
University of California at Berkeley
University of Southern California - Information of Sciences Institute

In addition Lincoln Laboratory, Jet Propulsion Laboratory and Texas Instruments also participate in this program. Participants in the material sciences portion of the program include most of the above as well as Cornell University, University of Pennsylvania, Rockwell International, Westinghouse, Hughes, IBM and several smaller companies specializing in unique fabrication and/or analytical capabilities.

Senator Stennis: Just what types of military applications do you foresee for this technology? Would you indicate the degree of maturity or status of your technology program for each of these applications?

Dr. Fossum: The design and fabrication methodologies which will emerge from the DARPA research program could be applied to the development of any custom integrated circuit chip. Since a major goal of this effort is to reduce the cost and time required to design custom integrated circuits, there will be a major benefit for military systems which frequently have low volume production requirements, and hence receive little or no attention from the semiconductor industry. This technology will allow reduction of the number of discrete components and small-scale integration chips in defense systems by designing and fabricating a custom chip which performs a collection of functions. This approach can reduce the cost of a system as well as increase its reliability.

The research on innovative architectures could have a significant impact on future military systems requiring vast amounts of computation power in a small volume. Examples include satellite-based surveillance and communications systems, airborne radar, autonomous target selection and terminal homing for strategic and tactical missles, sonar and seismic data processing, to name only a few. The research has not yet reached a state of maturity to apply to these major applications. Significant brassboard demonstrations of new capabilities should be realized in the 1983-86 period, with impact on operational systems in the period 1987-90 and beyond. Efforts are underway to develop a training program and an initial set of design software to provide this technology to defense industries, including those which have not previously had access to semiconductor technology.

QUESTIONS SUBMITTED BY SENATOR CHILES

Engine Model Derivative Program (EMDP)

Senator Chiles. The Senate Appropriations Committee did not agree with the House Appropriations Committee when the House provided all additional money in EMDP for the F101X. In conference the House receded to the Senate's position of mandatory competition in the higher thrust range above what is now available in the F100 for the additional money--providing there should be a requirement for this increased thrust.

Has a requirement for increased thrust be identified which would permit allocation of the additional funds, and if so, how has the money in the FY 1981 budget been allocated between competing engine manufacturers?

Dr. Wade. At the present time there is no stated requirement for increased thrust for F-15, F-16 and/or F-14 aircraft. The Department of Defense does not consider application of the $25M additional appropriations for the Engine Model Derivative Program (EMDP) as being contingent upon a requirement for increased thrust. The Joint Conference Committee added the proviso that "...durability and reliability shall be given appropriate emphasis in any future engine developments." Therefore, we consider the committee action as emphasizing two points: (1) allocation of funds to ensure full and fair competition on alternate options and (2) continuing emphasis on reliability and durability for future engines. I believe that the F101X (F101 Derivative Fighter Engine (DFE)) established competition in the high thrust afterburning turbofan fighter engines. Prior to this effort there was no competition to the F100 engine or its derivatives. Top priority for DoD funded programs for both the F100 and the F101 DFE continues to be enhanced durability within that engine thrust class. The FY 81 allocation of funds within the EMDP shows an increase in funding for the derivative F100 engine as well as application of the additional funds to the F101 DFE. DoD is expending considerable resources in the engine Component Improvement Program (CIP) and a parallel effort on a derivative F100 engine in the EMDP to enhance the durability, operability and performance of the F100 engine. From a total view of research and development funds allocation on the F100 and the F101 DFE in CIP and/or EMDP, I believe that we are pursuing this goal of competitive options in a responsible and equitable manner. The following data shows the R&D funds allocation in FY 81.

	FY 81 APPROPRIATIONS ALLOCATION ($ in M)	
	Pratt & Whitney F100 or Derivatives	General Electric F101 DFE
Engine Component Improvement (PE 64268F)	$56.7	$0
Engine Model Derivative Program (PE 64218F)	$12.4	$51.4
TOTAL	$69.1	$51.4

Engine Model Derivative Program (EMDP)

Senator Chiles. Both the F101X and the F100 are engines based on 1969 technology. In the event that the F101X were put into the fleet in the 1985-90 timeframe, to receive any return on investment, this engine would have to remain in the inventory well into the 21st century--to be cost effective in any manner. In other words, production of the F101X would commit this country to 1969 technology for fighter engines into the 21st century.

Could you comment on this?

Dr. Wade. It is true that the initial designs for the F100 and the F101X (F101 Derivative Fighter Engine (DFE)) were based on 1969 technology. However, it would not be accurate to tag them as 1969 technology engines because the F100 has been systematically improved with "new" technology through the engine Component Improvement Program (CIP) since 1973 and the F101 DFE core was qualified in 1976 with a high pressure turbine representing 1976 technology. The fact is that the F-15, F-16 and F-14 will be in operational service well into the 21st century and the F101 DFE and/or the F100 (and its derivatives) are the only options for powering these aircraft. Key elements in the propulsion for these aircraft are durability, reliability, maintainability, operability and supportability. That is what our derivative engine programs are emphasizing. New technologies will continue to be infused into the F101 DFE and the F100 (and its derivatives) as needed. Thus pursuit of the F101 DFE or the derivative F100 would not commit us to "old" technology which would not be adequate for the F-15, F-16 or F-14. In parallel with keeping these aircraft systems viable, we will be pursuing new aircraft and propulsion initiatives for a new generation of fighter/attack aircraft which would be the mainstay of our force in the first part of the 21st century.

Engine Model Derivative Program (EMDP)

Senator Chiles. I understand that Air Force calculations show that it would take $350 to $400 million for full scale development of the F101X and that GAO estimates this cost to more likely be $800 million. According to GAO it would take 12 to 14 years for the engine to reach normal maturity, and even at that time there would be no assurance that the engine would be better than the F100.

Could you comment?

Dr. Wade. The current Air Force estimate is that full scale development for Air Force only application of the F101X (F101 Derivative Fighter Engine (DFE)) is approximately $243M. The AF/Navy estimate for a joint development of the F101 DFE for application to F-15, F-16 and F-14 would be approximately $393M. The GAO estimate was based on their perspective of the F101 DFE program and without due consideration for the fundamental attention to durability/life and mission oriented testing which are key features of the program. Further, the cost and time to maturity were based on extrapolations from prior engine programs which did not recognize or emphasize mission oriented durability testing or design for durability. In the DoD response to the GAO report in 1980 we addressed these and other areas with which we could not agree. The F100 engine has taught us some difficult lessons about what the real measures of merit for a fighter engine are, especially high thrust afterburning turbofan engines. It also taught us that perhaps we shouldn't put all our eggs in one basket. The F101 DFE provides the only real competitive alternative to the F100 and its derivatives in the mid-to-late eighties time period. In addition it permits DoD to capitalize on its investment in the the F101 (B-1 engine). I believe that the exceptional success in both the ground and flight test program to date for the F101 DFE is an adequate response to the GAO projection. This does not mean that we might not have growing pains if the F101 DFE were put into service but our success thus far gives us reason to be very optimistic about the engine.

SUBCOMMITTEE RECESS

Senator **Stevens**. I am already late to another hearing that I was supposed to chair. I appreciate your cooperation and we will have another hearing tomorrow at 8 o'clock. So we will stand in recess until tomorrow when we will receive a Defense budget overview from Jack Borsting and the service budget officers.

Thank you very much, gentlemen.

[Whereupon, at 11:10 a.m., Wednesday, March 11, the subcommittee was recessed to convene at 8 a.m. on Thursday, March 12.]

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1982

MONDAY, MARCH 30, 1981

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, D.C.

The subcommittee met at 8 a.m. in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, Schmitt, Andrews, Kasten, and Rudman.

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE ARMY

PROCUREMENT AND RESEARCH, DEVELOPMENT, TEST AND EVALUATION

STATEMENT OF ARTHUR DAOULAS, ACTING ASSISTANT SECRETARY OF THE ARMY (RESEARCH, DEVELOPMENT AND ACQUISITION)

ACCOMPANIED BY LT. GEN. DONALD R. KEITH, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION

BUDGET REQUEST

Senator **STEVENS**. Good morning, gentlemen.

Today we will hear the testimony of Mr. Arthur Daoulas, Acting Assistant Secretary of the Army for Research, Development and Acquisition, and Lt. Gen. Donald R. Keith, Deputy Chief of Staff for Research, Development and Acquisition for the Army.

The amended fiscal year 1982 budget request for Army Research, Development and Acquisition is $19 billion, of which $3.9 billion is for Research and Development and $15.1 billion is for Procurement. In addition, the fiscal year 1981 supplemental for the Army requests $79.5 million for Research and Development and $1.7 billion for Procurement.

It may be necessary to close this hearing this morning due to the classification of materials to be covered. In the event that classified materials are to be covered, the witnesses or members of the subcommittee should indicate their desire to close the hearing. If this is the case, those individuals not cleared and having the need to know will be required to leave.

Mr. Secretary and General, you may submit your detailed statements for the record and summarize your oral statements if you wish, please.

I do expect to have some other members of our subcommittee here in a little while.

Now, one of you does have a confidential restricted statement.

Mr. DAOULAS. Yes, sir, the general does.

General KEITH. My coverage of the program, the summary of that, sir, is secret. At the point that I begin my presentation to the subcommittee, I think they should close.

Senator STEVENS. I am hopeful that the other members will be here soon, but let us proceed with the Secretary first and we will see what time that is.

Mr. DAOULAS. Yes, sir.

General Keith and I are very appreciative of the opportunity to appear before this committee. I would like to have my opening statement submitted for the record as opposed to reading it.

Senator STEVENS. Well, I have read it.

Mr. DAOULAS. I think it is imperative that we do go into closed session since the bulk of the material which we do have to present to the committee is indeed classified.

PREPARED STATEMENT

Senator STEVENS. Very well then. Your prepared statement will be inserted in the record at this point.

[The statement follows:]

BALANCED FORCES CONCEPT

Mr. Chairman and distinguished members, it is indeed a pleasure to appear before this committee. General Keith and I appreciate this opportunity to discuss the Army's fiscal year 1982 Research, Development and Acquisition request. We feel this session is of extreme importance since our Army finds itself at an important crossroad in our history. We are at a point in time when the present gap in our conventional war fighting capability vis-a-vis that of the Soviet's can begin to be closed.

This opportunity to rectify today's major imbalance in conventional armaments cannot be foregone. To do so simply increases the risk of hostilities by having to rely largely upon theater and strategic nuclear forces for deterrence. In order to achieve a credible defense posture, we must achieve a proper balance across the full spectrum of our military forces.

This concept of balanced forces is equally important within the Army. Our structure must have the proper ratio of light, medium, and heavy units to be responsive to our global missions and responsibilities. In addition, this force structure must be maintained in a ready-to-fight posture while we introduce modern weapon systems needed to counter those of our adversaries. We cannot afford to mortgage our future by postponing our modernization programs. Our central focus, therefore, is the attainment of a balanced and flexible force which capitalizes on the technologies of precision-guided missiles, compound armor, microelectronics, nuclear and chemical weapons, and mass production.

The challenge we face is formidable. In years past, we took comfort in the pursuit of a strategy which would offset Soviet numerical superiority by developing qualitatively superior weapons. The massive and continuing commitment of Soviet resources to armaments production has effectively negated this strategy. This is manifested in their tanks where their T-64s and T-72s outperform our M-60s; their BMP is truly an infantry fighting vehicle as opposed to our M113 personnel carrier. In brief, they now possess both a quantitative and qualitative advantage in virtually all categories of weaponry. Fortunately, we have now completed an extensive research and development program for major weapon systems to alleviate the aforementioned disparity. We are encouraged by the fact that in this and succeeding years we are in a position to field a newly-equipped Army, one that will close the current qualitative gap in combat materiel. Our new tank will outshoot, outmove and outsurvive any other tank that has been built. Our new fighting vehicle will be an extremely efficient and compatible running mate to that tank. Our two new helicopters—one to take out enemy armor and the other to provide us with mobility—have been built. Our laser-homing artillery shells are currently in production and we are providing our artillery with a multiple rocket launcher capability. We have done this and much more.

This is not to say that we have solved all our problems. We have been able to solve most of our technical challenges, but we have not been able to buy our newly-developed systems in a manner which would minimize costs. We are encouraged, however, with the emphasis being given to this issue by the Congress. Multiyear contracting as provided for in H.R. 745, coupled with economic production rates, will significantly reduce production costs and simultaneously energize our sagging industrial base by signaling industry that the Nation is indeed committed to enhancing our military capability. The Army's contribution to this effort will be to improve our planning, programing, and budgeting systems coincident with increasing the efficiency and effectiveness of our acquisition process.

What we seek now is the appropriation of sufficient funds to procure the weapon systems which we need in the force structure today, and your continued support of our research and development programs to assure that we are not confronted with a technology gap at any time in the future. Our soldiers, if called upon to face an adversary in battle, deserve to have combat equipment which is second to none in the world.

General Keith is now going to give you a short overview of our major systems—their status, funding, and issues. Subsequently, we both stand ready to answer your questions.

Biographical Sketch

Mr. Arthur Daoulas (Day-o-les) became the Acting Assistant Secretary of the Army (Research, Development and Acquisition) in February 1981 and has served as the Deputy Assistant Secretary of the Army (Acquisition) since February 1980. In this acpacity, he also serves as the Chairman, Army Contract Adjustment Board.

Mr. Daoulas was born 24 October 1931 in Lowell, Massachusetts. He graduated from the University of Maryland with a B.A. Degree in 1959, and received a B.S. Degree in Civil Engineering from the University of Missouri in 1962. He also received an M.B.A. Degree from George Washington University in 1973. Additional education includes the Advance Course, USA Engineer School, USA Command and General Staff College, and the Army War College.

Prior to his appointment as Deputy Assistant Secretary, Mr. Daoulas was the President of his own firm, Alpha International, Inc. He assumed this position upon retirement in 1979 from the U.S. Army after twenty-six years of service with the Corps of Engineers. From 1973 to 1979, he served as the Assistant Deputy for Materiel Acquisition in the Army Secretariat. Preceding assignments included: Director of Facilities Engineering; Staff and Faculty, USA Engineer School; Commander, 864th Engineer Battalion, Vietnam; Chief, Army Materiel Programs, JUSMAGG, Greece; Chief, Nuclear Weapons Branch, USA Engineer School and various assignments both in the United States and overseas.

Membership in Professional Societies include Chi Epsilon; he is also a member of the Sigma Phi Epsilon Fraternity.

Mr. Daoulas is married to the former Elaine J. Alexiou. They are the parents of three sons: William, age 25, John, age 23, and Christos, age 20. They reside at 8310 Ramsgate Court, Alexandria, Virginia 22309.

RECESS

Senator Stevens. Without objection, we will close the hearing for the purpose of hearing classified information. All those who have not been properly cleared, I will ask that you retire.

[Whereupon, at 8:02 a.m., the subcommittee recessed the open portion of the hearing to resume in executive session.]

Executive Session

STATEMENT OF ARTHUR DAOULAS, ACTING ASSISTANT SECRETARY OF THE ARMY (RESEARCH, DEVELOPMENT AND ACQUISITION)

ACCOMPANIED BY LT. GEN. DONALD R. KEITH, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT, AND ACQUISITION

The subcommittee convened in executive session at 8:02 a.m., in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, Schmitt, Andrews, Kasten and Rudman.

PREPARED STATEMENT

Senator STEVENS. At this time the subcommittee is in executive session.

Mr. DAOULAS. At this time, Mr. Chairman, I would like to ask General Keith to give the committee a short overview of our major systems, their status, funding and issues.

Senator STEVENS. General Keith.

General KEITH. Thank you very much, Mr. Chairman.

It is indeed a pleasure for us to appear before this subcommittee and, as you indicated, sir, I would appreciate it if my detailed statement would be submitted for the record.

I would like to point out that that statement was prepared at the time we prepared the Carter budget.

Senator STEVENS. I read that statement.

General KEITH. I have a brief addendum which indicates that the relatively grim assessment that I gave in that has been greatly assistive in the amended budget as submitted by the new adminisration. Therefore, I would request that that short addendum be ubmitted for the record as well.

[The statement follows:]

PREPARED STATEMENT OF LT. GEN. DONALD R. KEITH

DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT & ACQUISITION

I appreciate the opportunity to appear before this Committee today to present an overview of our major Research, Development and Acquisition programs.

Mr. Chairman, with your permission, I would like to insert my long statement into the record. Since this statement was put to bed with the Carter Budget, the grim assessment I have reflected is no longer valid with President Reagan's budget. I have portrayed this in a short addendum to my statement which I would also like to put into the record.

I. Introduction

Rather than cover each system in isolation I would like to discuss them in context of how we evaluate our overall progress vis-a-vis the Soviets. Obviously, our equipment requirements must be measured against the threat whether it be the Soviets themselves or Soviet equipment in the hands of surrogate forces. So we will also take a brief look at the Soviet's qualitative and quantitative equipment trends. By viewing our requirements by mission area you will be able to see how we intend this equipment to work together on a combined arms battlefield where the proper leverage can be applied by a smaller force to defeat a much larger one. As we move along I'll point out any technical problems or issues that need addressing. At the end of the presentation, I will explain why costs have grown in some of our systems since we reported to the Congress last year.

II. The Combined Arms Battlefield.

It is not weapons themselves that win battles but their carefully orchestrated employment--with all arms and all services playing close knit, indispensable roles. That is the combined arms concept in a nutshell, and from it stems the belief that all elements of an Army must be modernized in a balanced way so that no enemy can exploit weak links in the chain.

Accordingly, we have designed our new equipment from the outset to work together. Their value--that is their decisive value--is based on teamwork. For example, the Infantry Fighting Vehicle and the Abrams tank working together will give us an armored punch unequalled in any Army. Without the IFV, however, the capability of the Abrams tank is cut to the quick; it would have to slow to a relative crawl if our infantry was in our current armored personnel carriers and we would also be without the IFV's suppressive fire support that helps the tank survive. Because this is true of all of our new systems we base our acquisition strategy on it. That is, we plan to buy all of our new equipment in a balanced package-equipping our highest priority units first.

The combined arms battlefield encapsulates the efforts of a number of mission areas. Examples are close combat, fire support, air defense, and aviation. Just as there is no ultimate conventional weapon, there is no one decisive mission area that will win the battle for you. It is axiomatic in the combined arms concept that you need to be capable in every mission area. A lack in any one could be a fatal flaw for the entire operation. Sending our Abrams tank and IFV to counterattack without similarly capable close air support and air defense would be futile. In short, our strategy for buying and allocating new systems is based on how our mission area capability stacks up with the threat posed by the Soviets. I would like to briefly assess our individual programs within that context. Let me capsulize the overall Soviet threat.

III. Threat Overview.

At the present time there is not one major comparative US-Soviet tactical equipment trend running in favor of the US. Some of the quantitative ratios and trends are alarming, but it is the qualitative trend that undermines our basic military strategy, since quality equipment is the leverage for the combined arms team. As Mr. Daoulas stressed earlier, since 1970, the Soviet Union has fielded in excess of 60 new systems and there is no evidence that this modernization process is slowing down. The estimated dollar cost of Soviet outlays for land forces over the past decade has been three times ours - a trend that is expected to continue through the 1980's.

THE THREAT

PROJECTED ASSETS ON HAND AT THE END OF FY82

QUANTITY ISSUE

ON HAND

(Deleted)

TANKS	OTHER ARMORED VEHICLES
1:2.6	1:1.9

QUALITY ISSUE

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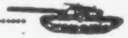
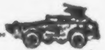
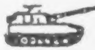
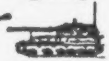
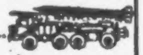
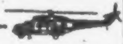
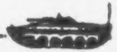
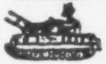
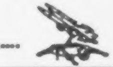
TANKS		
ANTITANK GUIDED MISSILES		
FIELD ARTILLERY (CANNON)		
FIELD ARTILLERY (ROCKET)		
ATTACK HELICOPTERS		
INFANTRY COMBAT VEHICLES		
AIR DEFENSE GUNS		
SURFACE TO AIR MISSILES		

CAPACITY ISSUE

PRODUCTION/YEAR

(Deleted)

TANKS	OTHER ARMORED VEHICLES
1:3.7	1:1.3

VUGRAPH (1)—"THE THREAT"

The results of the Soviet's massive investment in modernization is reflected quite vividly in this slide. As you see, in the area of qualitative comparisons, the Soviets have better tanks, antitank guided missiles, field artillery rockets, attack helicopters, infantry combat vehicles and air defense guns. The quantity issue is illustrated by the relative number of tanks and other armored vehicles shown on the left side of the screen. They enjoy similar ratios in other ground combat equipment. Their rate of production is shown on the right of the screen. The Soviets are literally on a mobilization basis right now. We don't ever expect to match them man for man or weapon for weapon. However, I believe that it is unacceptable for our soldiers to be "out-qualitied" and we have the equipment at or near the procurement stage to reverse that trend. Let me now highlight our program by mission area and explain how our requirements to counter the Soviet threat can be satisfied.

IV. Programs by Mission Area.

Close combat relates to the application of direct combat power. Just the term close combat connotes two adversaries standing eyeball to eyeball, pitting man against man, tank against tank, slugging it out until a decisive winner is decided or a piece of terrain controlled. This mission area includes such items as tanks, fighting vehicle systems, and direct line-of-sight antitank weapons. I will discuss attack helicopters under aviation.

We are woefully behind the Soviets in numbers and quality of fielded Close Combat equipment. In tanks we are greatly outnumbered as reflected earlier. The Soviets have fielded 3 new tanks since 1960--the T-62, T-64, and the T-72. They have thousands of T-62's in the field--a tank roughly comparable to our M60. They have produced about 10,000 T-64's and T-72's so far and these are the world's two best fielded tanks. We now have reason to believe that the T-64 and T-72, (deleted).

We also believe that the armor on the newest Soviet tank, the T-80, will be even tougher. We expect the T-80 to enter service in (d) with full production achieved (deleted). The T-80 is considered comparable in combat capabilities to our M-1 Abrams tank.

Another of our most glaring deficiencies is in the area of armored personnel carriers. The Soviets have had in the field, for over a decade, an infantry fighting vehicle called the BMP. A second generation BMP with improved protection and firepower may have reached IOC last year. It is expected to complement the current family of tanks and armored carriers and be compatible with the T-80 tank.

Our lag in this area is so significant that it could very well prove decisive in a mechanized war. I won't get too deeply into the specifics of each vehicle, but the Soviet BMP can kill tanks with a missile or automatic loading cannon. Its infantry squad can fire from inside the vehicle, which is mobile and fairly well armored. Our M113, on the other hand, has only a .50 caliber machine gun for armament and the troops cannot fight from the inside. The vehicle is clumsy, slow, thin skinned, and urgently needs to be replaced.

(Vugraph (2)—Close Combat follows:)

CLOSE COMBAT

($ IN MILLIONS)

SYSTEM	IOC	FY 82 RDTE	FY 82 PROC QTY/$
ABRAMS	15 JAN 1981	28.5	720/1,924.0
M60A3 (MODS)	JUN 1979	-	360/ 154.5
FVS	OCT 1982	106.7	600/ 928.5
TOW II	(Deleted)	6.6	12K/ 207.7
VIPER	(Deleted)	-	59K/ 77.4

VUGRAPH (2)—"CLOSE COMBAT"

The M-1 Abrams tank is in production and reached its IOC on 15 January 1981 with the 1st Cavalry Division, Fort Hood, Texas. It is the finest tank in the world today and more than doubles the performance capability of the M-60. We have been concerned, as you have, that due to the assessment of the Soviet's capability, our rate of production is too low. We have I believe with the FY 81 supplemental and Revised FY 82 President's Budget, turned the corner in this regard. By requesting an additional 209 Abrams tanks in FY 81 and 720 in FY 82 we have taken our first step to achieve a ramp up rate of 90 vehicles per month by January 1985. Included within the FY 82 request is $212 million in advance procurement funds to purchase long lead items for the 802 Abrams tanks that we will request in FY 83. Right now the Abrams tank is completing DT/OT III at Fort Hood. As you may recall, we had technical difficulties with the power train, specifically the engine and in fact structured a separate portion of our operational test to measure power train reliability and durability. While we have experienced some failures on the early tanks delivered to test we now believe that the engineering fixes are successful and in fact we have had no power train failures during operational testing at Fort Hood.

Since a large part of our force will still be equipped with the M-60 series tanks for some time, we need to upgrade them to extend their combat effectiveness into the 1990's. With upgrading modifications, the M60A3 will be superior to the Soviet T-62's and T-55's, but still inferior to the T-64 and T-72. The latest version of the M60A3 has a tank thermal night sight, a laser rangefinder, and a solid-state ballistic computer. In FY 81 and FY 82 we are requesting funds to procure 180 and 360 M60A3 (TTS) conversion kits respectively. In addition, we will also produce 120 M60A3 in FY 81. We intend to accomplish this by the end of the FY 1984 funded delivery period. Our fire control production problems appear to be solved and both producers should be at full rate by the end of FY 1981. We also anticipate that the backlog of new production tanks at Detroit will be eliminated by December of this year.

The Infantry and Cavalry Fighting Vehicle, which we call The Fighting Vehicle System, was a development success and the first production model is due to roll out on schedule in May of 1981. We are having no technical problems, but there has been a significant cost growth that I can address later. The FY 81 supplemental and the FY 82 Revised President's Budget requests will put FVS program back on track, so that we are able to ramp up to 90 vehicles per month by February of 1986. There are no dollars in either FY 81 or FY 82 to develop a second source for the vehicle itself. We are, however, planning to break out the major subcomponents for competition as rapidly as possible and will continue to consider competing the prime contractor if studies of potential second sources show promise and out year resources give us a high enough rate to make that sensible.

We previously mentioned the (deleted).

In order to keep TOW lethal we have been involved in a crash program to upgrade it. The first upgrade will be a new five-inch warhead of improved design. Those Improved-TOWs are in production and the (deleted). A more lethal 6-inch warhead is being developed in the second phase of the program. This program has some risk but continues to progress toward developmental and operational testing in June 1981. All technical problems to date have been minor. We are requesting funds in FY 82 to complete R&D and to procure 12,000 missiles.

Since some enemy armor is always going to penetrate our defenses we have given our infantry platoon a last ditch antitank weapon called VIPER. It is manportable and fires accurately to a range of 300 meters. The scheduled IOC date for VIPER is (deleted) and we want to produce 59,000 in FY 82.

Lets now move on to the fire support mission area. This includes all elements of the field artillery system from weapons to target acquisition including ammunition.

Fire support systems play a number of key roles on the combined arms battlefield. One is slowing and destroying the successive waves of enemy forces as he attacks. This task is made tougher by the Soviet's early use of their own artillery, which we must neutralize through effecitve counterfire. Finally, fire support is a key element in the counter offensive. Take away effective artillery support from attacking armor and mechanized infantry and you send it into a meat grinder of enemy antitank munitions that can operate with relative impunity.

We are presently outnumbered and outranged by the Soviets in conventional artillery. We also expect that, (d) towed systems and (d) self propelled systems will enter the Soviet inventory in the (d) [Deleted]. This when combined with improvements in artillery munitions and fire control, will seriously affect the conventional artillery balance. The Soviets presently supplement their tube artillery with a 122- and (d)-millimeter free flight rocket system.

While it is not likely we will ever equal the Soviet's numerical strength in field artillery weapons there are several areas where we can reverse the qualitative situation during the coming years.

(Vugraph (3)—"Fire Support" follows:)

FIRE SUPPORT

($ IN MILLIONS)

SYSTEM	IOC	FY 82 RDTE	FY 82 PROC EU/MSL/$
PERSHING II	DEC 1983	151.1	-/ 39/21 .7
CSWS	(Deleted)	11.8	-
MLRS	1Q FY 83	38.3	68/2,496/204.8
COPPERHEAD	NOV 1981	3.3	-/4,550/144.7
GLLD	NOV 1981	-	240/ - / 59.0
FISTV	1Q FY 85	9.6	-
AN/TPQ-37	DEC 1980	-	12/ - / 95.6

VUGRAPH (3)—"FIRE SUPPORT"

Let me start with the Pershing II which will replace the Pershing Ia as SACEUR's Quick Reaction Theater Nuclear capability. It has twice the range of Pershing Ia and much greater accuracy. It is in full scale engineering development with an IOC date of December 1983. The Soviet counterpart is the SS-20 ballistic missile, which now threatens virtually all installations and cities in Western Europe. There are no technical problems with Pershing II.

We are requesting $217.7 million to procure 39 missiles and an additional $151.1 million in R&D to support the flight test program and other testing.

The next system shown as CSWS is the Corps Support Weapon System. It will be a general purpose missile system to replace the aging LANCE in our corps artillery. A special task force has been established to conduct the concept definition phase. We plan to evaluate the integration of the cost effective elements of the Assault Breaker terminally guided submunition and provide for conventional, chemical and nuclear warhead options. FY 82 funds provide for continuation of the special task force activities culminating in development decision.

Our answer to the Soviets artillery advantage is the Multiple Launch Rocket System, MLRS. It's first priority will be to silence enemy artillery. But it will also be able to supplement general support artillery during surge conditions, help in air defense suppression and attack the Soviet's 2nd echelon, since it has a range of over 30 kilometers. System growth is also possible by adding terminally guided warheads. MLRS is on schedule in the 40th month of an accelerated 63 month acquisition program, achieving technical goals, and is being managed within cost.

Within the RDTE appropriation we are requesting an additional $3.3 million in FY 81 and a total of $38.3 million in FY 82 to complete a number of critical development tasks that must accomplished prior to fielding. Our FY 82 procurement request is for $204.8 million to procure 2,496 rockets and 68 launchers.

Copperhead is the first indirect fire precision guided munition in history. The Soviets have no counterpart weapon. It is a laser-guided projectile that is fired from a standard 155mm howitzer at ranges out to 16 kilometers. The FY 82 revised President's budget will allow us to procure 4,550 rounds. The RDTE money is to enhance its warhead and extend its range.

The Ground Laser Locator Designator, GLLD, is used by our forward observors to "spotlight" targets for laser-homing munitions such as Copperhead and aerial delivered munitions. Note that it will IOC along with Copperhead in November 1981. For light forces the GLLD will remain tripod mounted but for mechanized and armored divisions we are developing a Fire Support Team Vehicle, FISTV, which will give the forward observers needed armor protection, mobility, and communications. The FISTV is equipped with a GLLD and a north seeking gyro that provides the direction needed for accurate artillery fire requests. The program is progressing satisfactorily and procurement should begin in FY 83.

The last item is the AN/TPQ-37, counterbattery radar. It can locate enemy tube artillery out to 30 kilometers and rockets out to 50 kilometers. It permits rapid engagement by friendly counterfire. The FY 82 Budget for $95.6 million procures 12 systems.

Let's now turn our attention to Air Defense.

Indeed, it is one area that should not be underestimated. No modern Army can expect to win in battle unless its forces operate under an umbrella of capable air defense systems. The air threat is large and growing.

Warsaw Pact forces have approximately 3,200 combat aircraft in the Central European area, with the potential of adding another (d) after reinforcement from the Soviet Union. Approximately 1,000 more are deployed on the flanks.

Qualitative improvements include increased payloads, longer operating ranges, significantly higher ECM levels, and all-weather attack capabilities. The most significant addition to the threat for our division combat forces is the very capable HIND attack helicopter with improved fire control and ordnance loads. There are approximately (d) in Warsaw Pact forces today.

The Army has a thorough plan for modernizing its air defense systems to cope with this increasing Soviet air threat--the 1991 Air Defense Objective Force. The ammended FY 82 President's budget provides the necessary funds to continue modernizing toward this objective.

(Vugraph (4)—Air Defense follows:)

AIR DEFENSE
($ IN MILLIONS)

SYSTEM	IOC	FY 82 RDTE	FY 82 PROC FU/MSL/$
PATRIOT	JAN 1983	58.0	12/ 364/900.5
I-HAWK	NOV 1972	39.6	-/ - / 83.7
CHAPARRAL	NOV 1969	19.7	/ - / 68.4
DIVAD	2Q FY 85	30.0	50/ - /372.2
ROLAND	(Deleted)	4.0	31/ 795/529.3
STINGER	FEB 1981	16.2	-/2,544/224.3

Vugraph (4)—"Air Defense"

Patriot, the first priority and keystone of the modernization program, is a long-range missile system which will first replace the over-age Nike Hercules and ultimately the I-HAWK systems. It is designed to defeat saturation raids by large numbers of sophisticated aircraft employing electronic countermeasures (ECM). It is the only High to Medium Altitude system capable of operating in the ECM environment expected in the mid-eighties and beyond.

Patriot is now in limited production and deliveries of 5 fire units and 117 missiles will begin in February of 1982. FY 81 and FY 82 testing will demonstrate that all corrections to prior shortcomings are successful. By the end of FY 82 sufficient test data will be available to authorize full scale production.

We are requesting research and development funds of $23.4 in the FY 81 supplemental and $58.0 in the revised President's budget to continue the ECCM growth program and for software diagnostic improvements. Our FY 82 revised President's budget procurement request for $900.5 million will procure 12 fire units and 364 missiles.

The I-HAWK missile system is the mainstay of the Army's low to medium altitude air defense. It will remain in the force until the 1990's. We are presently modifying I-HAWK to enhance its capability to operate in the expected ECM environment. Our FY 82 RDTE request will permit an early start on Phase III of I-HAWK product improvement program. Our FY 82 procurement request will enable us to buy 288 replacement rocket motors, produce ECCM kits and procure enough optical trackers and other tracking radar improvements for 4 CONUS I-HAWK battalions.

Chaparral is the Army's current short-range, air defense missile system. It is being improved and will remain in the force through the 1990's. Improvements to Chaparral include smokeless rocket motors to reduce its firing signature; development of an Identification Friend or Foe (IFF) device, a guidance system improvement to keep it effective against targets using countermeasures and Forward Looking Infrared modules to allow the operator to see targets at night and under poor weather conditions. We are having no technical problems with any of these improvement programs.

The Division Air Defense Gun, DIVAD, with its larger caliber gun, armor protection and full-tracked mobility, will replace the 20-millimeter Vulcan system which cannot provide adequate air defense protection to rapidly moving armored forces. DIVAD will be able to defeat both low-flying fixed wing aircraft and helicopters. As you know, the DIVAD gun development is a competitive program between contractors employing existing European cannons and US fire control systems. Both development contractors were given maximum flexibility to encourage design of a less costly, more effective system. DIVAD's twenty-nine month development program was breached due to a lack of funding. If our FY 82 request is approved and expected out year funding received the program will be back on track. Source selection and the initial contract award is scheduled for April 1981. Our FY 82 request is for $30.0 million in RDTE for completing system development, ILS, support equipment and testing. Our $372.2 million request for procurement will allow us to buy 50 guns. $59 million is also being requested for DIVAD ammunition and an ammunition production facility.

Roland is the Army's only all-weather short range air defense missile system. A single fire unit can track and destroy up to ten enemy aircraft in a matter of minutes. We need this firepower to meet the growing all-weather low altitude threat from high performance Soviet aircraft. The FY 82 RDTE request for $4 million will be used for our share of the US-European program to make ROLAND capable of handling the post 1985 ECM threat. The $30 million in the FY 81 supplemental request is for tooling to increase the production rate from 17 fire units per year to 60 per year by FY 83. Our FY 82 request procures 31 fire units and 795 missiles. Current plans are to buy four battalions of ROLAND.

The last air defense system I would like to cover is Stinger, a shoulder fired anti-aircraft missile that provides point air defense coverage within combat units. Stinger replaces the 1960 vintage Redeye which can no longer cope with the threat. STINGER can handle the best of the Soviet fixed wing and helicopter aircraft from any aspect. It is in production and is now operational in Europe. Our FY 82 procurement request of $224.3 million will allow us to procure 2,544 missiles.

I would like to turn now to the Aviation Mission Area, beginning with the Advanced Attack Helicopter.

(Vugraph (5)—Aviation follows:)

AVIATION

($ IN MILLIONS)

SYSTEM	IOC	RDTE	FY 82 PROC QTY/$
AAH	JAN 1985	92.2	14/464.1
HELLFIRE	JAN 1985	24.3	1,075/130.1
AHIP	MAR 1986	38.6	-
CH-47D	FEB 1984	-	19/228.0
BLACK HAWK	NOV 1979	6.2	96/629.7

VUGRAPH (5)—"AVIATION"

The threat the AAH is designed to meet relates again to the overwhelming force and blitzkrieg tactics the Soviets can throw at us across a broad front in the initial stages of war.

The AAH will be able to fly quickly to critical points on the battlefield to augment ground combat units or operate as an independent tank killer in an economy of force operation. The AAH can destroy up to 16 tanks per sortie using its HELLFIRE missiles, and may well become the most lethal anti-armor weapon in the US inventory. It can also attack softer targets with its 30 mm gun and area targets with 2.75 inch rockets. It can do all of this in day, night and adverse weather. This year we will complete operational testing and make our production decision.

We are requesting $8.0 million in procurement in the FY 81 supplemental for AAH to procure initial spares. Our FY 82 RDTE budget request is for $92.2 million to complete development and testing. Our procurement request is for $464.1 million to fund advance procurement and to produce 14 AAHs. As you may recall from last year we told you that we had to modify the tail of the AAH in order to reduce vibrations to an acceptable level. I am pleased to report to you this year testing has verified the success of that modification and we are preparing for the last phase of operational testing in preparation for a production decision in December of 1981.

HELLFIRE, which is nearing completion of full scale engineering development, is the main armament of the AAH. HELLFIRE homes on a laser spot that can be projected from the AAH itself or from another airborne or ground designator. This allows the AAH to launch HELLFIRE indirectly, in some situations without even seeing the target. It also allows for engaging multiple targets simultaneously.

In testing, the missile has performed magnificently - nearly 90% success rate. The only problem that we have had with HELLFIRE is its cost growth - and I can talk to that later if you desire.

Our FY 82 budget request is for $24.3 million to complete development and test. We are also requesting $130.1 million to procure 1,075 missiles in FY 82.

As you recall from last years testimony we had intended to begin engineering development of a fire and forget infrared imaging seeker for the HELLFIRE missile. While the requirement for such a capability remains, a recent review led us to decide that available technology for both the target acquisition function and the seeker did not provide enough of an improvement over the laser system to warrant initiation of full scale development at this time. We do intend to continue technology work in order to satisfy this requirement.

Next I would like to cover the Army Helicopter Improvement Program (AHIP). The program's goal is to select from among current inventory air frames, the best candidate for modification into a scout helicopter with improved high-density altitude, hot day performance.

The improved scout helicopter is urgently needed to fully exploit the capabilities of our attack helicopters and to acquire and laser designate targets for COPPERHEAD and other precision guided munitions. Its Mast Mounted Sight (MMS) will have a laser designator, and optics that can operate at night and in adverse weather.

FY 82 RDTE funds will buy three prototype mast mounted sights and integrate the mission equipment package into the selected airframe for test.

The CH-47 Chinook is the Army's only active medium-lift helicopter. Its primary missions is the logistical and tactical movement of vital materiel, weapons, and troops on the battlefield. Chinook was first fielded in 1962. We are extending the useful life of the A, B and C models beyond the year 2000 by a modernization program.

We are on schedule, on cost and there are no technical problems. The FY 82 request funds the modernization of 19 CH-47s and buys long lead items for 24 aircraft in FY 83. The IOC date for the D model is February of 1984.

BLACK HAWK is a new utility helicopter that is replacing the UH1 "Huey" in air assault, air cavalry and aeromedical evacuation missions. This aircraft can carry a full squad and can sling load a wide variety of equipment. As of the end of January, six combat support aviation companies in the 101st Airborne Division (Air Assault) have received a total of 113 BLACK HAWKS. Our FY 82 RDTE request is for $6.2 million to continue external stores support system development and to demonstrate the feasibility of carrying HELLFIRE missiles on that system. We are requesting $629.7 million in FY 82 to procure 96 BLACK HAWK aircraft. The cost growth associated with this program can be discussed later, if you desire.

(Vugraph (6)—C^{3}I follows:)

C^3I

($ IN MILLIONS)

SYSTEM	IOC	FY 82 RDTE	FY 82 PROC QTY/$
SINCGARS	SEP 1987	15.2	0
TRI-TAC	FEB 1983	48.1	110.0
TACSATCOM	VARIOUS	15.3	63.8
PLRS	SEP 1984	9.6	30.5
PLRS/JTIDS (ADDS)	FY 88	18.7	0
SOTAS	(Deleted)	69.8	0
RPV	4Q FY 85	73.3	0

VUGRAPH (6)—C^3I

The next mission area I would like to cover is Command, Control, Communications, and Intelligence, or C^3I. This is a complex area in terms of technology but our goals are simple to define. First, we need to tie all of our forces together by secure, responsive communication systems that will work in fluid battle situations in an intense countermeasures environment In terms of intelligence, we must gather every bit of information possible on enemy movements and get it to commanders in time for them to position their forces and employ their weapons effectively.

On the other side of the coin we need electronic warfare equipment to disrupt enemy command, control, and communication capabilities. I won't have time to touch on any of these systems today, but they could well be crucial in slowing a Warsaw Pact attack. This is an area where they are vulnerable because of their rigid hierarchal structure and the diverse makeup of their forces.

I would like to start the C^3I overview off with the Army's future tactical radio, SINCGARS. SINCGARS (Single Channel Ground and Radio System) will give the soldier a jam-resistant, securable radio system capable of operating in all combat environments.

The FY 82 budget will support the fabrication and testing of the Advanced Development models from 3 competing contractors. If program success warrants, we will accelerate the program by approximately 2 years because this radio is urgently needed.

The next program is the Joint Tactical Communications (TRI-TAC) program. This is a Joint service and DoD Agency program to develop and field future tactical multichannel switched communications. This equipment is urgently needed to replace the non-secure, obsolete, manpower intensive, and predominantly manual communications equipment currently in the field. TRI-TAC equipment will provide for an evolutionary transisition from analog communications to modern and flexible digital communications. This equipment will incorporate both nuclear hardening and electronic countermeasure resistance.

FY 82 RDTE funds will be used to continue support of the TRI-TAC Office and the Joint Test Facility, as well as the development of Army assigned items.

The Army was responsible for developing the TRI-TAC switches. The

FY 82 request allows us to continue procuring the circuit and message switches which will be the heart of the multichannel network.

The Army is also responsible for development of ground terminals for Tactical Satellite Communications (TACSATCOM) for all services.

The current program consists of: A single channel UHF system supporting Nuclear storage sites that is in production with first deliveries in March 31; a Multi-Channel system in the Super High Frequency (SHF) range that is in production with an IOC of IQ FY 83; and the manpack UHF terminal that will begin production this fiscal year.

The next system is the Position Locating Reporting System (PLRS), which is a joint Army and USMC development. It provides combat commanders with automatic, precise location of their forces on the battlefield, and navigation information to those forces. It is crypto secure and highly resistant to jamming.

RDTE funds will be used to complete OT II and to develop the logistic support package. Procurement funds will buy the first division set of PLRS to be fielded to the 1st Cav Division in 1984.

We are also continuing with the joint PLRS/JTIDS program. JTIDS--or Joint Tactical Information Distribution System--is a high capacity digital data link to be used by all services. It is now in full-scale development. By combining JTIDS with PLRS we will be able to efficiently provide the data communication needed for the late 1980's while retaining the position location function.

FY 82 RDTE funds will complete the integration of PLRS and JTIDS and begin conducting applications testing. Let's turn now to two intelligence/target acquisition systems. First, the Standoff Target Acquisition System (SOTAS), which employs a moving target indicator radar mounted on a BLACK HAWK helicopter. SOTAS searches deep into enemy territory and transmits information on the enemy's movement to ground stations located at division brigade, and division artillery headquarters. This, in turn, allows commanders to position their forces advantageously and to target the enemy for fire by Army and Air Force weapons. SOTAS is in full-scale engineering development, with airborne and ground station subsystems being tested, and total system integration being initiated.

The SOTAS program is technically sound, but hardware (data link and antenna) will require more development effort than earlier estimated.

While Critical Design Reviews have confirmed that the SOTAS approach is sound, they have also shown that earlier cost/schedule estimates were over optimistic. I can cover the specifics if you desire.

SOTAS can also be used to support the Remotely Piloted Vehicle (RPV), which is the next system I will cover. The RPV is a small aircraft equipped with a TV that is monitored by personnel in a van near the launch site. With long-range target location data provided by SOTAS, the RPV can fly to target areas out to (d) kilometers. Once there, the RPV can locate targets, adjust artillery fire, or laser designate targets for destruction. Reconnaissance will be another high priority function. The RPV carries the approximate radar signature of a seagull and is incredibly hard to track and hit.

The RPV will continue in full scale engineering development in preparation for operational testing in FY 1983. The RPV program was restructured from 43 to 52 months due to data link technical problems and cost growth in the RPV itself and the MICNS data link. MICNS stands for Modular Integrated Communication and Navigation Systems. It is a common data link device for SOTAS, RPV, and the Air Force's Precision Locating Strike System (PLSS).

The first RPV flight with an interim data link is scheduled for August 81, and the first flight with a MICNS data link is June 82.

I would next like to cover the mission area we call Combat Support. The President's Budget as originally structured provided only the minimum funds required to support the Army's needs. The revised President's Budget provides a significant increase in this mission area. For example the amended budget provides an additional $131 million for 10 ton trucks, over $200 million for 5 ton trucks, $108 million for administrative use and support type-vehicles. In addition, the amendment includes approximately $400 million specifically for POMCUS that will be used to procure additional combat service support type equipment for prepositioning in POMCUS.

Our first element contains both R&D and procurement funds for the development and fielding of the family of scatterable mines. The Artillery—delivered

Antipersonnel Mine (ADAM) and the Remote Artillery—delivered Antitank Mine (RAAM) are both in production and should achieve IOC during the 1Q FY 82. The Ground Emplaced Mine Scattering System (GEMSS) entered production during the first quarter of FY 81. The Modular Pack Mine System (MOPMS) and the off Route Antitank Mine (ORATMS) are currently in engineering and advanced development respectively.

The Army's fielded capability to detect and clear threat mine fields is based on World War II technology. The current countermine program is designed to field a family of mutually supporting detection and neutralization devices and includes a mine clearing roller, type classified limited production urgent (LPU), product improvement (PIPs) for hand held detectors, a Surface Launched Unit Fuel Air Explosive (SLUFAE), ready to go into production but unfunded, a Vehicle Mounted Road Mine Detector (VMRMDS), a Vehicle Magnetic Signature Duplicator (VEMASID) and several other R&D devices/systems that will enhance our detections and neutralizations capability and allow us to detect mine fields as well as neutralize them from stand-off distances. Our FY 82 request is for R&D funds only: engineering development of the VMRMDS and a Portable Mine Neutralization System (POMINS) and advanced development of a counterobstacle Vehicle (COV) and for an improved fuel-air explosive mine neutralization system (CANETIP).

As shown we are requesting $40.7 million to fund the non-recurring costs of the two years initial production program and the production of 36 units of the M9 Armored Combat Earthmover (ACE). The M9 can dramatically increase the survivability of tanks and other weapons systems. With its greater speed, mobility and survivability, the M9 provides fighting positions and obstacles where and when needed by the combined arms team.

We intend to spend $7.6 million in R&D and $26.9 million in procurement during FY 82 for tactical bridging equipment. Items to be bought include bridge erection boats, ribbon bridge internal bags, medium girder bridges, bridge erection sets and reinforcing sets.

Our critical shortage of 5 ton tactical trucks should be somewhat lessened by the FY 82 budget request. Our FY 82 request is for 3,372 for $301.7 million. In addition, we are requesting $200.6 million to purchase 1,152 10 ton trucks. We will procure a combination of M.A.N. (57) and HEMTT (1095) trucks. The entire

MAN buy will support the PII program. Other special purpose requirements for the HEMTT are for 66 HEMTTS to support the MLRS and 71 to support the Patriot programs.

The High Mobility Multipurpose Wheeled Vehicle (HMMWV) development program is designed to provide a successor to selected 1/4 ton (jeep), 1 1/4 ton trucks, all 1/2 ton Mules and 1 1/4 ton gama goats. It will also be used in airborned, airmobile and light infantry divisions as the launch vehicle for TOW. Requests for proposal were released on 25 February of this year. We intend to award prototype contract awards to three contractors on 29 June 1981.

The Services have very limited capability to meet water production, purification, storage, distribution, and cooling requirements in an arid environment. The Army, as DOD executive Agent for Land-Based Water Resources, is coordinating joint doctrine, operating concepts, equipment requirements and funding programs for provision of water to support a Rapid Deployment Joint Task Force which will probably be confronted with no host nation support. This $61.6 million program, coupled with limited prior year acquisitions, is designed to provide minimum essential support to meet the Army's requirements to support the RDJTF beyond the other Service's internal capabilities/requirements. Programmed equipment includes drilling rigs, purification units, storage bags/containers, pipeline systems, and cooling units.

In the area of POL, the Army is requesting $1.7 million in RDTE to continue efforts on bulk tank assembly. The $82.9 million in procurement will allow us to procure a myriad of equipment which includes: 5,000 gallon tanker trucks, tank mooring systems, POL fabric tanks, pump assemblies, loseline outfits and fuel system supply points.

INTRODUCTION

General **Keith**. Rather than cover each of the Army systems that we are going to present for your consideration today in isolation, I would like to try and put them in the context of how we evaluate our overall progress vis-a-vis the Soviets.

Obviously our equipment requirements must be measured against the threat, whether it be in the hands of the Soviets themselves or in the some of their surrogate forces. So we will also take a brief look at the Soviets' qualitative and quantitative equipment trends. By viewing our requirements by mission area you will be able to see how we intend this equipment to work together on a combined arms battlefield where the proper leverage can be applied by a smaller force to defeat a much larger force.

As we move along I will point out any technical problems or issues that need addressing. I am prepared, since I know you have been exposed to the SAR reports that showed cost growth in some of our programs to discuss cost growth in general or specifically as you may please after I have been through the program summary.

[Slide presentation.]

COMBINED ARMS BATTLEFIELD

Now, a little bit about the combined arms battlefield. It is not weapons themselves that win battles but their carefully orchestrated employment with all the arms and services playing all their own close-knit, indispensable roles. That is the combined arms concept in a nutshell and from it stems the belief that all the elements of an Army must act together. They must be modernized together and in a balanced way so that no enemy can exploit weak links in the chain.

Accordingly, we have designed our new equipment from the outset to work together. Their value, their decisive value, is based upon team work.

For example, the infantry fighting vehicle shown on that slide must be working together with the main battle tank, the Abrams if we hope to get the impact of that combined arms maneuver capability.

If we did not have the infantry fighting vehicle, the tank would have to slow to a relative crawl and our infantrymen would be riding in a vehicle that they could not see out of, could not fire from and in fact could not keep up with the main battle tank.

This is generally true of all of the Army systems; that is, they must be designed from the outset, as they have been, to work together and we must acquire them in a balanced way and equip our highest priority units first rather than buying a few of the high glamour items for all of the force.

The combined arms battlefield encapsulates the efforts of a number of mission areas. We divide our program into mission areas so that we can assess this balance that I am speaking about. Some examples are close combat, fire support, air defense, and aviation.

Just as there is no ultimate weapon, there is also no one decisive mission area that will win the battle for you. It is axiomatic in the combined arms concept that you need to be capable in every mission area. A lack in any one could be a fatal flaw for the entire operation.

With that then as a backdrop, I would like to enter into a discussion, first of all, by taking a broad look at the threat and then moving into the mission area discussions.

Senator **STEVENS**. Let's just skip the threat. I think we know the threat.

THREAT OVERVIEW

General **KEITH**. All right, sir.

I would like to put one slide up for you to look at if you don't mind, sir.

Senator **STEVENS**. All right.

General **KEITH**. I am not sure whether you have seen that kind of a presentation. Very quickly in the center you have a picture of the quality and you see that the Soviets in fielded equipment clearly have a qualitative edge in every ground combat category, fielded now.

The quantity issue over on the left, as you can see, is anywhere from 3 to 4 to 1 no matter how you want to slice it, in every major ground combat capability.

The capacity issue on the right says that they literally are mobilized at this time. Not only are they evolving new and better equipment, but they are producing at such a rate that I would judge them to be practically on a wartime footing at this point in time.

Now, we don't expect to ever meet them on a man-for-man or on an item-for-item basis. But I submit to you, Mr. Chairman, that it is not acceptable for this great Nation to be outqualified and I simply wanted to make that point.

CLOSE COMBAT

Let's go then to the program starting with close combat. This relates to the application of direct combat power. Just as the term "close combat" implies, there are two adversaries literally standing eyeball to eyeball, playing man against man, tank against tank and slugging it out until a decisive winner is decided or a piece of terrain is controlled.

This mission area includes such items as tanks, fighting vehicles, the direct line of sight antitank weapons and in fact includes the attack helicopter as well, but I am going to wrap that into the aviation mission area.

Let's take a look at first the Soviet tank picture to put in perspective what the threat is demanding of us. We are behind in the tank area, as you probably know. The Soviets have fielded three new tanks since 1960, the T-62, the T-64, and the T-72. They have thousands of T-62's in the field, a tank that is roughly comparable to our M60, the one in the hands of our troops now.

They have also produced about [deleted] T-64 and T-72 tanks. So far these are the world's best fielded tanks. We now have reason to believe that the T-64 and the T-72 may be [deleted] which is the best one we have out there.

We also believe that the [deleted] on the newest Soviet tank, the [deleted]. We expect the T-80 to enter the service [deleted] with full production achieved in the [deleted].

Although we do not know precisely what the T-80 is, we can expect it to begin to reach comparability with the Abrams.

Other of our most glaring deficiencies in the area of armored personnel carriers become obvious when you look at the Soviet infantry fighting vehicle, the BMP which has been fielded now for nearly 10 years. A second generation BMP with improved protection and firepower we believe is about to reach IOC. It is expected to complement the current family of tanks and armored personnel carriers and be compatible with their new T-80.

Our lag in this area is so significant we believe that it could well prove decisive if we did have to fight them. I am not going to get into great detailed specifics on each of these vehicles, but the BMP can kill tanks with a missile onboard and an automatic loaded 73 millimeter cannon.

Its infantry squad can fire from inside the vehicle which is mobile and quite well armored. Our M113 which is in the hands of our troops today, on the other hand, is a battlefield taxi. Our troops cannot see out from it and it is armed with a 50-caliber machinegun.

Senator STEVENS. How old is that?

General KEITH. We have had that in the field since the late 1950's or early 1960's, sir.

Fortunately, we have the opportunity to do something about it and let me show you what is on the menu.

M1 ABRAMS TANK

First of all, the M1 Abrams tank is now in production. It reached its initial operational capability on January 15 with a battalion in the First Cavalry Division at Fort Hood, Tex. It is the finest tank in the world today and more than doubles the performance capability of the M60.

Senator STEVENS. What about the T-80?

General KEITH. We don't know enough about the T-80, sir, to judge that precisely. But if you look at the trend line in Soviet tanks where they have surpassed the M60 with the T-64 and T-72 that are out there today, it is safe to assume that the T-80 tanks are going to be better than they are. In that case you have to say it is surely approaching the quality of the Abrams tank.

Now, our big problem is the rate at which we are going to be able to get that tank out there. Obviously, we have been concerned about getting them to our troops in numbers as fast as we can. Fortunately, with the 1981 supplemental and the revised 1982 President's request, we believe we have turned the corner in this regard.

By requesting an additional 209 Abrams tanks in fiscal year 1981 and 720 in fiscal year 1982 we have taken our first step to achieve a ramp up to the rate of 90 vehicles a month by January 1985.

Included with the 1982 request is $212 million also for advanced procurement to purchase the long-lead items for 802 tanks that we project for production in fiscal 1983. So we are right on the glide path now that we had previously planned.

OPERATIONAL TESTING OF ABRAMS

The Abrams is just now completing its final round of operational tests at Fort Hood. You may recall that in prior testing we had technical difficulties with the tank, particularly in the power train and specifically the engine. As a result, we had to structure a special portion of our operational test to measure power train durability and reliability.

While we have indeed experienced some failures in the early tanks delivered to test, we now believe that the engineering fixes are successful. The failures were embedded in quality control rather than fundamental engineering design and in fact, we have had no engine replacements during the current operational testing with that battalion at Fort Hood.

Senator SCHMITT. Excuse me. Mr. Chairman, that is not exactly what we heard the other day. We will get to that in questions.

General KEITH. I would be happy to take it now, Senator Schmitt.

ABRAMS ENGINE DESIGN

Senator SCHMITT. The other day I got the strong impression that there was a design problem that wasn't picked up in the early phases of the design.

General KEITH. We went through a couple of stages in the engine. Two years ago we put a blue-ribbon panel together and there were some minor engineering changes that they recommended and the program manager implemented. The latest round of problems was in the mechanization of the production of the engine on the floor. The most pressing problem was with a turbine blade. There is an angle of camber that has to be cut at the base of the blade so that radial forces transferred to bearings on the shaft of the engine are precise. It took us 60 days to find out that when they went from essentially hand building the engines in the early stages of production to coming up to rate on the floor that the machine cutting the base of the blade was off by 1 degree. That radially unloaded one of the bearings, and the bearing skated rather than rolled. As a result the bearing failed.

FILTER AND BASIC DESIGN PROBLEMS OF ABRAMS

Senator SCHMITT. But the earlier problems with filters and basic design problems.

General KEITH. Well, we are going way into ancient history now, sir. Back in the original test a couple of years ago we had mechanical engineering problems. That is, air filters that removed the dust and dirt indeed were allowed to be put in by a soldier in such a way that there was not a firm seal. We redesigned the air-cleaner system to make it what we would call Murphy proof. We have not had a recurrence of failures due to dust since in fact we sent the tank back to Yuma, Ariz., and punished it again in the desert to be sure that we had that dust problem solved. The current concern was this bearing problem, and it is corrected now.

Generally speaking we have had nothing but quality control problems. Now, I don't want to belittle these because as you are coming up to production, even though your engineering development model is working just fine, if you don't have good quality control in the production item as you come up to rate, you will end up sending a bummer out to the troops. We are very aware of that and we have an extensive effort to be sure that we have got those problems licked, not only at the subcontractors for such items as the engine, but at the prime assembly plant in Lima, Ohio, as well.

GROUND TURBINE TECHNOLOGY

Senator **Rudman**. Who builds the engine, General?

General **Keith**. Avco-Lycoming, sir. They have built us aircraft engines for a long, long time.

Senator **Schmitt**. One might question the earlier decision to give them the turbine contract since they had never built a turbine.

General **Keith**. They have built a lot of turbines, sir, for airplanes. They supply almost all of our helicopter engines except for the newest engine, the T–700, which is built by GE.

Senator **Schmitt**. The ground turbine technology had been largely in the automotive industry.

General **Keith**. We had been working in the technology base on ground turbines for fully 5 years before we went into it in the tank.

Senator **Schmitt**. Let's don't bog down on that.

General **Keith**. They had the contract for that technology work, sir. So it was a sensible award. They were the most advanced of our industry in doing that.

M60 TANK

Let's move, then, to M60. Clearly, it is going to be a long time before we get rid of the M60, well into the late 1990's. So it is important that we continue the upgrading modifications that have been going on for some time. The latest version of the M60 is called the M60A3. It has thermal night vision sight, a laser rangefinder, and a solid state ballistic computer which fire controlwise makes this a state-of-the-art kind of tank.

Senator **Stevens**. Well, it is still inferior to all three of the Soviets' tanks. Why do you want to buy any more of them?

General **Keith**. We are not buying more generally, sir. We are upgrading those that we have because we simply can't get the M1's in enough quantity out there for a period of time. We have right now against an acquisition objective of 16,227 tanks for our 24-division force; we only own about 11,000 and that is a mixture of tanks all the way back to M48 vintage which is prior to the M60 up through the modernized M60's.

That tank is at least a match for the T–62 which is still in the Soviet inventory in some quantity. We simply don't have a choice but to make that tank as good as we can until we get a high quantity of M1's.

Senator **Stevens**. Is that graph right? You are going to get 360 of them this year.

General **Keith**. Those are modification kits, sir, to upgrade that number of M60A3's.

Senator **Schmitt**. Is that a field mod?

General **Keith**. They go through Anniston Depot for that modification, sir, and also the Mainz Depot in Europe.

Now, I said we are not buying. I have to qualify that. In the fiscal year 1981 supplemental, there is a request for 120 new M60A3 tanks. The issue there is one of keeping the M60 production base warm and all of its vendor supplies so that for security assistance as we are providing tanks to our allies, there is in fact a warm base to do that. We simply cannot divert any of the M1 production that is so badly needed by our forces for military sales cases.

So it is important to the Nation that we have a warm M60 base for that purpose. The 120 tanks that will be produced will go to the U.S. Army. As I said, we are short and we can use them. But the primary purpose is to not allow that tank base to go cold.

Mr. DAOULAS. General Keith, let me add that there is another dimension as to why we would want to keep the M60 production base warm at this juncture. As we go through a transition period from producing the M60, going from a high to a low rate of production and doing the reverse with our M1 Abrams tank, we want to hold on to that M60 production base until such time as we have absolute certainty that we can produce the M1 Abrams tank at high rates of production before that M60 base indeed goes cold.

FIGHTING VEHICLE SYSTEM

General KEITH. All right, sir, in moving then to the fighting vehicle system which is the name that embodies both the infantry fighting vehicle and the cavalry fighting vehicle, the vehicles are identical except for the interior arrangement for the Infantry versus the Cavalry. This has been a development success. The first production model is due to roll out on schedule in this coming May. We are having no technical problems with it, but there has been cost growth in this program and I will be prepared to discuss that with you later on, if you would like.

Senator SCHMITT. Over and above inflation?

General KEITH. Over and above inflation. It is embedded in some of the things that we deliberately decided to do with this vehicle as the threat evolved and I can go into that now or later, whichever you please.

Senator STEVENS. Who is making it now?

General KEITH. FMC Corp. is the prime contractor, sir. The fire control which is a large part of the cost is with Hughes Aircraft Co. The transmission is with General Electric. Those are the largest of the subcomponents that are broken out.

VEHICLE MISSION

Senator RUDMAN. What is the basic mission of that vehicle?

General KEITH. It is the fighting vehicle for a mechanized infantry squad or a cavalry section. In the mechanized infantry each squad, and there will be nine men carried in there, will be able to move at the same pace that a tank can across country. The 25-millimeter cannon that is in that turret is stabilized so it can fire on the move just as the cannon in the tank can to suppress particular antitank guided weapons and to keep them off the back of both of the tanks and the mechanized infantry. In the box on the side, the square looking thing on the turret there is a TOW launcher.

In the defensive situation we made the decision to add TOW missiles to this vehicle in order to thicken the antitank guided weapon population on the battlefield. Since we are so outnumbered in any defensive scenario you want to conjure up in Western Europe, this was an opportunity to use existing structure, that is the squad is there, and allow them to play in the defensive part of the battle at long range over 3,000 meters with the TOW There are seven TOW's carried inside there and two in the launcher.

PER VEHICLE COST

Senator RUDMAN. How much does this vehicle cost per copy?

General KEITH. It depends on what year dollars you want to talk about, sir.

Senator RUDMAN. This year's dollars.

General KEITH. At the front end of the learning curve it is going to be close to $1 million. It is over $900,000 per copy.

Senator RUDMAN. Thank you.

Senator SCHMITT. Is that a diesel or turbine?

General KEITH. That is diesel, sir.

Senator SCHMITT. What was the reason for the decision to go diesel rather than turbine?

General KEITH. It was an available diesel engine sized properly right out of the commercial marketplace, a high reliability proven diesel, where at the horsepower of the tank we had no such diesel and we were in the process of inventing two of them and drawing a judgment about which from the two would be the best. This is made by the Cummins Co. and they make a lot of diesels.

Senator SCHMITT. But there are in the field maintenance difficulties with maintaining two propulsion systems?

General KEITH. No, sir, I don't believe so. Our experience with the turbine with soldiers in maintenance battalions is that they like it very much.

Senator SCHMITT. Well, I am not saying that I don't like it, but don't you have to duplicate the supply and maintenance systems for the two of them?

General KEITH. You do, sir, but you are talking about a 500-horsepower engine or 450 I guess it is, and you have a logistics tail with the parts that go with that. Even if it were a diesel in a tank you would have a logistics tail that is peculiar to that.

Senator SCHMITT. So there is no duplication there as a result of two different types of propulsion?

General KEITH. No, sir.

BASELINE COST OF VEHICLE

Senator STEVENS. What was the cost problem you mentioned?

General KEITH. The baseline cost that we started out on with this vehicle was described from below the turret and is essentially what you see there. When we made the decision to go from an old Hispano Suiza 20-millimeter cannon which was in the inventory at the time we started this development and to go to a 25 so that we could defeat the BMP, and the 20 simply wouldn't hack it. That is the Soviet's infantry fighting vehicle and the 20 would bounce off of it. So we had to go to a 25 and we also, as I say, made the decision to put TOW on. We were confronted with a situation where we had to do something about being outtanked. We could have put more TOW's into dedicated TOW force structure. In fact, over the 20-year life cycle of any weapons system it is the cost of people that drives the equation.

So what we decided to do was to do was to use structure that was already there to thicken up the antitank guided weapons by putting it into every mechanized infantry squad's vehicles and letting those people do that job rather than having dedicated ATGW force structure.

Now, when we did that we obviously created a more expensive vehicle. But overall it was a cheaper solution for the Army.

So it is a combination of these engineering changes, the marketplace, what has happened to the price of aluminum and the price of the 113 has also gone out the top because aluminum has increased three or four times at the rate of steel, for instance, and these are aluminum hulls in both the armored personnel carrier and in this fighting vehicle.

So it is a combination of all of those things that have driven the cost of this vehicle up.

Senator SCHMITT. This is the same chassis for the new——

General KEITH. MLRS, sir.

Senator SCHMITT. What is that?

General KEITH. Multiple launch rocket system. We use this chassis. It is really a good one from the durability and maintainability standpoint. So we have used that chassis for the multiple launched rocket system.

Senator STEVENS. It is made of aluminum?

General KEITH. Yes, sir, it is. The body of that is aluminum armor.

As you can see, the 1982 request is for 600 vehicles. There are long leads in for the 1983. The R.D.T. & E. dollars finishes up all of the testing and particularly what we call the integrated logistics support package. The training devices, all of the manuals, all of the tests, measurements and diagnostic equipment and all of the things that allow you to train with and to maintain with in the field are paid for with the R. & D. dollars in the last increment.

TOW GUIDED MISSILE

The TOW 2. The TOW guided missile, and that is the original design, has been in our inventory since the midsixties. [Deleted]. It is a two step program.

The first step simply took the TOW as it was designed, 5 inches in diameter, internal warhead dimension and put a more efficient warhead on it. We could do that very rapidly. [Deleted.] But with the gradient of armor that we have been confronted with and expecting the T-80 is going to be tougher, we could take the outside dimension of the missile itself, which is nearly 6 inches, and use that same warhead design and get even more penetration. That is the second phase that is hot on the trail of the first phase.

Senator SCHMITT. Is that through development?

General KEITH. We are through with the 5 inch and that is being applied. The $6.6 million is to furnish the 6 inch.

NIGHT VISION SIGHTING DEVICE

Now, there is another fix that goes along with this. When you put the night vision device that you see that soldier looking through there on, it allows you to see at night, but it also allows you to see through fog and other obscurants which are prevalent on the European battlefield. The way the missile is guided is with a wire that feeds out of the back to a guidance unit that you see in the box below the launcher, but there is a Xenon beacon in the original design that is sensed from the tracker that says where the missile is and when you keep the crosshairs on there is a command that goes over those wires to say move to where that crosshair is. [Deleted.]

[Deleted.] So there is that improvement along with the 6-inch warhead improvement that finally makes up TOW 2. We have a request to buy the first 12,000 of these missiles also as you see in the procurement side.

Senator **Schmitt**. They will go to Europe first?

General **Keith**. Yes, sir.

VIPER

Finally, for the last ditch defense by infantrymen, since there it is almost inevitable that some armor is going to get through, we have had in our inventory a light free-flight rocket called the LAW which has been treated as a round of ammunition for some time. LAW stocks are low and LAW effectiveness is also low. So we have brought along its replacement which we call the Viper. It more than doubles the range. This can fire out to 300 meters. Its warhead is more lethal and it flies truer because it travels much more rapidly and therefore has a higher hit probability.

That is a fiberglass tube. The round of ammunition is shipped in that fiberglass tube and that is not only its carrying case but its firing tube. We had technical difficulties with this round of ammunition. You will see where the aft end of that tube is with respect to the soldier's ear. The noise of that rocket was higher than the Surgeon General would allow for human exposure. Therefore we had to turn back and extend the tube, that fiberglass tube in order to overcome that.

The tests we have run since that has been redesigned shows that the noise levels are down but after a couple hundred rounds we had an incident of the fiberglass tube unraveling, if you will. So we have an engineering fix that has got to be made to that before we finally go into procurement. We think it is a pretty simple one and we are not greatly alarmed by it, but we are certainly going to produce it before we produce in quantity.

ARMBRUST WEAPON SYSTEM

Senator **Rudman**. General, you have had a lot of other problems with that particular unit like hitting the target and not exploding and just not functioning the way it is supposed to. There was a whole book written on that. Is there any reason why we are not going to the comparative weapon that was built by the Germans and has been well proven and is comparative to that weapon and in fact has had field tests and has worked very well? Other than procurement problems within the United States, is there any reason that we should continue to develop this when we had all of these problems and we have got a field deployed weapon that is good and does work?

General KEITH. Yes, sir, there are some good reasons.

Senator RUDMAN. Could you tell me the reasons?

General KEITH. The fusing problem that we had earlier are not with us still, sir. Armbrust weighs more than twice as much and to the infantry soldier weight is a very important consideration. In fact, the very design that I am talking to you about having problems with is trying to keep it light. You can always make things sturdy by going heavier.

No. 2, the Armbrust warhead in fact is not satisfactory and the latest offer that we have from MBB in Germany is for us to look again. We have looked three times and so has the Marine Corps. They say we will fix that warhead for you.

The other problem is that it really isn't a fielded weapon. The German Army has not bought it either for some of the same reasons. So it is a commercial venture, sir. We have looked at it. We have been enjoined to look at it almost every year by the Congress and so we circle back and keep looking but it is not a good trade for the soldier.

Senator RUDMAN. I would like to submit some questions for the record on that one.

General KEITH. All right, sir.

NOISE LEVELS OF VIPER SYSTEM

Senator SCHMITT. Why didn't you solve your problem by giving the infantrymen an earmuff or something?

General KEITH. He has to wear ear protection anyway. I am talking about noise levels using ear protection, sir.

Senator RUDMAN. I wonder if the Surgeon General has told the Russians how noisy their weapons could be? [Laughter.]

General KEITH. I understand your issue, sir.

Senator STEVENS. How often does that soldier fire one of those?

General KEITH. It would depend on the situation, sir.

Senator STEVENS. In training.

General KEITH. The average infantry soldier will fire probably three or four in the course of the year. The rest of the training will be on an empty tube in training him how to sight, position himself and whatever else.

NOISE LEVELS OF VARIOUS WEAPONS SYSTEMS

Senator SCHMITT. Could you provide us with a list for the record of noise levels associated with various weapons systems in comparison with this one?

General KEITH. Yes, sir.

Senator SCHMITT. Including jet aircraft engines and so forth.

General KEITH. I will have to research that part, the percussive kind of noises. We have problems with our field artillery in meeting the standards, too.

Senator SCHMITT. I am sure you do.

Senator **Rudman**. This really is a revelation to me. I mean, I cannot understand this and I would like to learn more about it and I intend to on my own.

General **Keith**. I should get one of those doctors to come and brief you, sir.

Senator **Stevens**. You get us the information and we will get them to come and brief us.

General **Keith**. We will put the information in the record and go from there, sir.

[The information follows:]

Noise Levels Associated With Army Weapon Systems

General **Keith**. The Medical Technical Guide, "Noise Hazard Evaluation Sound Level Data of Noise Sources," compiled by the U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD, contains blast overpressure (BOP) data on currently fielded systems. The data was collected from all available sources over a period of years and does not necessarily conform to recently adopted Army techniques. An all inclusive list of noise levels for all U.S. Army weapon systems, meeting the current measurement doctrine as published in ARBRL-SP-00014, "Standardization of Muzzle Blast Overpressure Measurements," April 1980 does not exist.

The U.S. Army Medical Research and Development Command has measured the following systems because preliminary data suggested a possible hazardous noise environment:

	Noise	Duration
VIPER, Antiarmor Rocket (tactical)	183.0db	16 msec
M198, 155mm Towed Howitzer (M203 charge)	180.5db	40 msec
M109, 155mm Self-Propelled (M203 charge)	181.0db	53 msec

The above figures are worst case data and exceed the current military design standard. The VIPER was given a provisional man-rating clearance by the Office of the Surgeon General in February 1981 based on human volunteer studies. Manrating tests for the M198 are planned for the summer of 1981.

Coordinated research programs to alleviate BOP hazards are currently ongoing at the Armaments Research and Development Command, Ballistics Research Laboratory, Human Engineering Laboratory, and Medical Research and Development Command.

FIRE SUPPORT

General **Keith**. I would like to turn now to the mission area of fire support. Fire support systems do indeed play a key role on the combined arms battlefield.

One is to slow and destroy successive waves of enemy forces as they attack. This task is made obviously even tougher by the Soviets' early use of their own artillery. They have lots of it and we have got to find a way to neutralize his artillery through effective counterfire.

Finally, fire support is a key element of any counteroffensive. If you take away artillery fire support from attacking armor and infantry you are going to send those maneuver units into a variable meat grinder. That lesson was well learned by the Israelis in the 1973 war.

We are presently outnumbered and outranged by the Soviets in conventional artillery. We expect that they will deploy [deleted] new towed systems and [deleted] new self-propelled systems during the 1980's. [Deleted.] There are some.

When this combines with their improvement in conventional munitions which they, like we, are pursuing, they are going to be a formidable fire support force that we have got to contend with.

Finally, they supplement these tubes with two different multiple launch rocket launchers. They have had for a long time both in Soviet and in pack forces 122-millimeter rocket launchers and they have recently fielded a new [deleted] millimeter free-flight rocket system.

Again, we don't expect to be able to equal the Soviets numerically but we simply have got to reverse the qualitative threat.

PERSHING II

Let's start then with the largest of the fire support family and a unique one, Pershing II. It is, in the broadest sense, fire support, but actually it is part of SACEUR's theater nuclear force. It gives quick reaction alert capability in Europe today in the form of Pershing I-A.

The Pershing II development, along with ground-launched cruise missiles, provides for that backbone of the theater nuclear force modernization program that Defense is pursuing.

Senator STEVENS. What is the range of that Pershing II?

General KEITH. The Pershing II more than doubles the range of Pershing I-A from [deleted] kilometers to [deleted] kilometers, sir.

The Pershing II, in order to get that range, has had to add two new methods. But by far the most important part of the improvement is in the front end in the guidance system. It has a radar area correlation system that allows accuracies on the order of [deleted] meters and therefore allows a much smaller nuclear warhead and therefore much less collateral damage.

So the combination of range, precision and low collateral damage is the nature of this improvement.

I should probably mention to you that the other holder of the Pershing is the Federal Republic of Germany. They also have Pershing I-A's as a part of the quick reaction force over there now. It is a political issue, as you know, with the Germans to increase the range to [deleted] kilometers, but they have been closely working with us on the total improvement and it is likely that they may opt for all of the improvements except the last stage of propulsion in order to get a more capable guidance system and therefore a lower collateral damage system.

Senator STEVENS. Where could you use the [deleted] kilometers from?

General KEITH. It will be used from the territory of the Federal Republic of Germany, sir, just as the Pershing I. There are sites there now.

Senator STEVENS. Would you say there are political problems to using them at all, the [deleted] kilometers?

Mr. DAOULAS. This is with regard to Pershing II's that will be in the inventory of the Federal Republic of Germany. There is no objection to the fact that the United States would have a Pershing II located in the FRG with a [deleted] kilometer capability.

General KEITH. As you can see, we are asking for $151 million R.D.T. & E. for the development work that is ongoing. We expect to be able to meet that IOC with a quite highly concurrent schedule in that we will have to make a production decision before all of the final testing is done. We will have seen some of the testing and that has been an issue as to the degree of concurrency.

We believe that the risk is such, knowing the basic Pershing system as we do, and with all of the captive flight testing that we have done with the critical guidance stage successfully, we believe that it makes sense to move out on that program.

CORPS SUPPORT WEAPONS SYSTEM

The next system that I would like to talk to is called the corps support weapons system.

We have in the field today at the corps level the Lance missile. We have had that in the field for more than 10 years now and it is a manpower intensive, marginally capable system that needs replacement.

One of the things that we will do with the Special Task Force that is now in place to look at concept definition for this system is to look at the technology fallout from the assault breaker technology demonstration that was begun 2 years ago.

To refresh your memory, assault breaker is an airborne radar for target acquisition midcourse guidance and a rocket fired either from the ground or from an airborne platform that has terminally guided submissiles within it. The idea is to be able to see deep and attack with individually targeting submunitions armor forces before they come forth to close at the main battle area.

So we will be looking at that submunition technology for one element of the corps support weapons system but we also have to look at other conventional warheads, the nuclear warhead and a chemical warhead as a part of the total system as we replace the Lance and all of its capabilities.

The multiple launched rocket system we referred to earlier. The chassis you see there is the same as the infantry fighting vehicle and the cavalry fighting vehicle. We simply hardened the cab. Three men ride in that cab and with a small microprocessor onboard that continually determines position, are able to stop, salvo fire their free-flight rockets and be gone in a matter of minutes.

This is our answer to being outgunned insofar as counterfire goes. It you link this system with the target acquisition means like the counterbattery radar, that I will talk to shortly, you can in fact get the equivalent firepower of 3 battalions of 8-inch howitzers on the way with one MLRS launcher very rapidly in an area suppression mission.

This has been an accelerated program. We are on schedule in the 41st month of a 63-month program. We have made a production decision. It has been a success story all the way.

Senator **RUDMAN**. Who manufactures that?

General **KEITH**. Vought, sir. We had competition between Boeing and Vought and Vought won. Both, by the way, brought very fine hardware to test. We had two winners to choose from.

Three of our European friends have been with us on this, the United Kingdom, the Federal Republic of Germany, and France. They have all contributed to a part of the development, like in the case of the Germans, they have done the mine warhead which will be available to all participants, or in the case of the United Kingdom and France where they have anted up $5 million a year, simply to stay in touch with the program. They have people in our program office and they are now looking at options of how they will coproduce it.

The next step is for a terminally guided submunition warhead which will come late in the eighties which we are negotiating with our European friends now on how we go about acquiring that jointly.

As you can see, we are finishing the maturity phase with the R. & D. dollars. Again, it is largely the integrated logistics package and final production validation testing of the production items as they come off the assembly line. With the 1982 request as amended, you can see we are buying 68 fire units and almost 2,500 rockets which is an urgently needed capability.

COPPERHEAD

Copperhead is the first indirect fire precision guided munition in history. It is a semiactive laser munition that can be fired from any standard 155-millimeter howitzer, either our towed M-198 or our self-propelled M-109-A-2. It can attack any target that has been illuminated with a laser spot designation, as we call it. That could come from an airborne platform, a ground designator or from a remotely piloted vehicle if we get that in our inventory some day.

We have had excellent results with this in test. In fact, we are now into low-rate production. We have the final production validation kind of testing to be sure that the reliability is held up in the production item. And, as you can see, we will be buying over 4,500 of these rounds of ammunition if the President's budget request is approved.

Senator RUDMAN. General, just let me ask a quick question. You said this is fired from a 155 tube?

General KEITH. Yes, sir.

Senator RUDMAN. And after it is fired then our guidance system takes over?

General KEITH. What happens, sir, is you get the general location of a target by whatever forward observer means you would want to use. You fire it ballistically. That in space we call a basket. The seeker has the capability to search. It searches on its way. It sees the laser spot after it comes into that basket and then homes. It is literally a flying missile at that point. It flies ballistically to the point of capture and then there are fins, as you can see, that all allows it to——

Senator RUDMAN. All the microelectronics in there is able to withstand that kind of a launch out of a tube?

General KEITH. It is several thousand g's and they have been hardened. That was the technology breakthrough that was required, sir. We have had good luck with it.

Senator STEVENS. How do you carry that?

General KEITH. It is carried with the artillery like a round of ammunition, sir.

Senator RUDMAN. How big is it?

General KEITH. It is a little longer than the normal round of ammunition. It is the same diameter obviously at 155.

Senator STEVENS. That looks like a cruise missile. Is that the size of it?

General KEITH. That is its size, sir.

Senator STEVENS. How long is it?

General KEITH. I would have to look up the dimensions. It is longer obviously than a pure projectile because it has got its propulsion unit with it. It is handleable by artillery crewmen. They ram it just like they would a normal round.

Senator SCHMITT. The only drawback is you have got to keep that laser spot on your target once it is in the basket.

General KEITH. Yes, sir. The limitation without an airborne platform is what a forward observer can see with a ground designator. That is where we are right now in that we do not have the airborne designator yet in our inventory but we are pursuing that.

You can imagine if we get an RPV and you have got something like a standoff target acquisition system or something that can cue an RPV, he can go out there [deleted] kilometers beyond where the guns are, see over the hill and for the first time attack with indirect fire precision hard targets. It is a tremendous capability.

Senator KASTEN. In your statement here it says the Soviets have no counterpart weapon.

General KEITH. We have seen no counterpart weapon. There is no known counterpart weapon. We know they are working with laser. Whether they would be able to do what we did, that is harden that front end to those kind of g forces is probably the trick.

Senator SCHMITT. Do they have a command problem also in getting this kind of fire control authority down to their infantryman level?

General KEITH. I don't believe so, sir. They use their battery commander as their forwarder observer rather than as we do a dedicated Lieutenant. But I don't believe a decentralization in authority would be a problem from what I know of the way they normally operate. That is a conjecture on my part. I don't know the answer exactly.

GROUND LASER DESIGNATOR

The Ground Laser Designator, the next item up there, is the item that is now available to put in the hands of the artillery forward observer. Obviously he is sitting out on top of the ground there. In a combat situation he would be dug in a hole.

In addition, in the mechanized force, to be able to keep up with mechanized infantry and armor, we are putting that designator into a vehicle which is the old 113 that we have put an articulating head on.

You may recall that we took this vehicle and made a TOW vehicle out of it, put the TOW tracker in that head. All we have done in this instance is take the TOW tracker out and put the ground laser designator in to give them a highly mobile and somewhat protected mechanized capability.

That is the FISTV vehicle, the next item on the list there. We are in the process now of finishing the development on that. It is an integration job. All of the components have been previously invented.

Senator SCHMITT. Is that diesel?

General KEITH. That is also a diesel, yes, sir. That is the M-113, armored personnel carrier that we have had for a long time in our inventory.

Senator RUDMAN. What is the effect of the targeting range of that laser unit?

General KEITH. Let me say first of all that it depends on the weather.

Senator RUDMAN. I understand.

General KEITH. In clear weather you can lase and track accurately with that thing for about 5 kilometers. The degredation in the laser energy is a function of the density of fog, smoke and whatever. One of the reasons we are anxious to get it in an airborne platform is that the normal smoke and artificial aerosol is that you can get down through it much easier than seeing through it this way from the ground.

This capability for a Middle East kind of contingency with a towed howitzer that is strategically mobile with a laser designator and probably being able to operate at full range almost all of the time in a desert kind of an environment is a pretty exciting add for firepower.

COUNTERBATTERY RADAR

The last item there is the counterbattery radar which, as you see, we have completed development on and we are in procurement. I simply wanted to talk to you for a moment about that because that gives us a dimension for counterfire that we have never had before.

That radar can see incoming artillery shells at 30 kilometers, incoming free-flight rockets at 50 kilometers and in fact during tests at Fort Sill we were able to with the digital data link through to our fire direction center from that radar acquire the incoming round, have the data computer by the fire direction computer on the guns and a counterfire round of ammunition on the way before the incomer got to the ground. Now that is just a dimension that we have never had and it is very important to us.

Now, you can imagine hooking this directly through that computer system to something like the multiple launch rocket system and being able to dump a whole load on a Soviet gun position is going to do a lot to keep those rockets and guns off our maneuver units and we are very excited by it.

Let's turn now to air defense.

Senator STEVENS. What is the time for delivery for those?

AIR DEFENSE

General KEITH. We are already delivering the initial units, sir. As you can see, we have IOC'ed it now in the continental United States. It, along with its little brother the countermortar radar, which operates similarly but it is smaller, will go to Europe [deleted].

Senator RUDMAN. They started developing that countermortar radar a long time ago, General, and it is finally perfected.

General **Keith**. This one particularly grew out of the requirement in the Vietnam war to try and get something to get the 130's you will recall who were hitting our fire bases with impunity at long range. We simply couldn't find them. So the development of this one and a replacement for the countermortar radar started at about the same time during the Vietnam conflict because our old radars just were not capable of handling that kind of a mission. They are both with us now. Both are in production and are both working very well.

Mr. **Daoulas**. General Keith, before you leave fire support, in reference to the earlier question on the length of the Copperhead, it is 4½ feet.

General **Keith**. Air defense. Now, air defense like fire support is something that you have to have if your maneuver units are going to be successful.

The Warsaw Pact forces have approximately 3,200 combat aircraft in the central European area with a potential of adding easily another [deleted] after reinforcement from the Soviet Union and there are another thousand or more deployed on the flanks if they wanted to bring that many to bear.

The qualitative improvements in the threat over the last few years have been generally increasing the payload giving longer operational ranges, significantly higher electronic countermeasure levels and all-weather attack capabilities.

I guess though that for the Army the most significant addition to the threat has been that helicopter that you see at right center there, the HIND which for a ground attack bird for our forward deployed forces is a very significant threat. It has got greatly improved fire control over the first versions now. They, like other things have improved it all the way from A through E models in the period of the 1970's and they are getting a lot of combat experience with it in Afghanistan and learning from it.

It is being produced in high quantity. There are now in Central Europe alone, even with all those off in Afghanistan, nearly [deleted] some are now identified as being opposite central European forces.

So we have had this constantly growing threat and need to do something about an air defense posture that has been neglected, to say the very least.

There is an objective plan that we have put together that we hope to arrive at by 1991. Up until this year with the amended President's budget the program hasn't come near to matching the plan. Fortunately the amended budget is now on target and I would like to tell you what that amounts to.

PATRIOT

First of all, the Patriot. The Patriot is the backbone of our modernization of the high- to medium-altitude air defense. On site in Europe now is the Nike-Hercules, vacuum tube technology of the early 1950's, a fine weapon in its day but [deleted] and very slow insofar as rate of fire. Each fire unit can handle one missile in the air at one time and that is it all the way to burst.

The Patriot is now completing the final stages of its development. In fact, the procurement decision was made for the first procurement a year ago. There are fire units and associated missiles now being produced at the plant at Raytheon.

The Patriot fire unit is incredibly capable. Its multifunction phased array radar is able to see, track and manage [deleted]. It is able to have in final guidance [deleted] of those missiles like you see coming out of the firing canisters. Again, the boxes that you see missiles being fired out of are used to ship the missile from the factory. They are shipped that way, transferred onto the launcher, fired and the containers then can be reused.

The Patriot also is able with today's software to be able to handle the threat out through the [deleted] electronic countermeasure projections. The R. & D. dollars that you see in there are primarily for finishing testing and for continuing work on the growth of the electronic counter-countermeasures to extend the useful life of Patriot out through the year [deleted]. That is largely a software job where you get wave forms of the expected threat jamming and find ways through the software of the computer as it manages the radar to work through it.

The Patriot has been a technical success with the exception of the software to handle [deleted] that we were unable to demonstrate in the last round of testing and that we had completely been able to handle. The software which handles the self-diagnosis of all of the electronics that are both in the computer and in the radar, we have a goal of being able to do over [deleted] percent of those maintenance functions. We have not reached that goal yet and have got to continue to work on that. In fact, it has improved since the last round of tests but that will be a long-term problem to be able to get all of the possible malfunctions and have that software tell us not only what is wrong but where the maintenance man has to go to fix it.

CHASSIS COMPONENT RELIABILITY PROBLEMS

Finally, there were a few chassis in the test that had some component reliability problems. Those have been isolated. The chassis themselves have been redesigned and retested as chassis but the full system now is production must demonstrate that all of these fixes, both hardware and software have been captured and successfully reproduced in production hardware as opposed to the R. & D. hardware that we tested initially.

We believe that the risk is moderate at the highest and that we ought to get on with fielding this system. The Carter budget had only fire units in it. The Reagan budget has 12. We believe that we should pursue that because we need this system so urgently and it is so much better than anything else out there even as it is even if we have to continue to grow the software which I predict we will do in all of these software-driven systems over time anyway.

Senator **Andrews**. But you said it is only going to be good to [deleted].

General **Keith**. [Deleted.] They will target on the Soviets from a collection point of view to get the wave forms that they are actually testing in their jammers and ultimately we have got to take those then and work out counter-countermeasures over time. We will just keep getting slices of those as we go. There will be R. & D. dollars in this program to continue that over the life of the system because it is a software driven system and we can go with it without having to go back and redesign hardware.

HARDWARE REDESIGN

Senator **Kasten**. You are saying that you won't have to go back to redesign hardware until the year [deleted].

General **Keith**. As far as we know right now. As far as what we are able to guess, this hardware will not have to be redesigned at all. Because the way you get at electronic counter countermeasures is to take threat wave forms, and then through the computer management of the radar itself to be able to work through those; that is, negate the jammer.

You have to have the wave form of the enemy jammer and then you have to work the budgeting of the computer to work through it and those are all software changes.

Senator **Stevens**. Let's go off the record a moment.

[Discussion off the record.]

General **Keith**. So in summary, as far as we know, we will be able to handle it all with software. That is a long way out there and I never say never in this business.

Senator **Andrews**. The point is that you are confident that if we get these 12 units they are going to be delivered about the time that the present software technology will [deleted]. So you say you are going to get the software.

General **Keith**. We are currently working on the software that is beyond.

Senator **Andrews**. When are those 12 going to come into inventory and be in field position [deleted]?

General **Keith**. The production lead time on these sets will run 1½ years or so. By the time they are in the hands of troops we are talking about at least [deleted].

Senator **Andrews**. So you are going to get them onboard in [deleted].

General **Keith**. Our estimate is, that is the case, sir. What we are working on is what the intelligence community tells us that they believe that the Soviets will have then. That is what we are working on.

In order to have enough lead time to work that, we have to postulate. Now, what I am saying though is that right while we are manufacturing those hardware items in the R. & D. budget we are also working the software extension for the threat. So it is not waiting until we have the hardware but we will be continuously working the software.

Senator **Andrews**. But you can't assure us that they are good for anymore than a [deleted].

General **Keith**. I can assure you that the hardware is, sir, and that is what we are buying. I can't assure you that we know precisely what the Soviets can do in software. I can tell you that what we have been given as some very, very demanding threat wave forms that are postulated out through the end of [deleted] we know how to manage. And I believe that, based upon that experience, if these wave forms continue to change, that we will be able to do as we have in the past which is, work the software problem. It takes time.

It is a fact, though, that waiting won't help you, sir. These are orders of magnitude better than what we have got out there. You could worst-case it, I suppose, and guess that there would be one ECM wave form perhaps that would give you trouble. The fact of the matter is that what the Soviets present us is [deleted]. How good they really will be in an attack formation, we don't know.

What we do is worse case it and work software to handle the worst possible case. Does that answer your question, sir?

Senator **ANDREWS**. Well, it answers my question, but the problem is, and we can't, you know, take all the time on this one, but the problem that gets me is that we march ahead and when we get the hardware we are not quite sure whether the hardware is going to be vulnerable or not on down the line and we can never be sure. We have Minuteman missiles out in my State that the Air Force has [deleted]. Yet we say they are one of the first lines of defense in the Triad. So I am continually nervous.

General **KEITH**. I understand, sir.

Senator **ANDREWS**. I have seen this stuff supposedly work and then not work. I just hope you are going on with the software program as fast as you are in the procurement of the hardware devices.

General **KEITH**. I can assure you we are, sir, and that is why that R. & D. number looks pretty big.

IMPROVED HAWK

The Improved Hawk is the next one I would like to talk to. That has been the mainstay of the Army's low- to medium-altitude defense since the 1960's. We have had over the life of the Hawk system a number of product improvements to continue to bring its capability up to being able to handle the threat of the time.

It, too, is subject to the same kind of concerns that we have expressed insofar as electronic countermeasures. So we continue to try and work the counter countermeasures with the Hawk system.

Our R. & D. request in the Hawk is to continue to work those product improvements. The procurement request for Hawk is to buy some replacement rocket motors, produce the electronic counter-countermeasure kits that we have proven in R. & D., and to procure enough optical trackers and other tracking radar improvements for four battalions.

CHAPARRAL

Chaparral, as you can see, has been with us for quite a while, too. It was first fielded in 1969. At that time it was identified as an interim system. In fact, it is a grandson of the Air Force's old Sidewinder heat-seeking missile. It, like the others, has gone through a number of product improvements over its life and we are continuing to do that because the Chaparral is going to be with us in the Active Forces through the 1990's and even then will probably see further life in the Reserve components.

So it is very important that we continue to keep that Chaparral system capable of doing its job.

The most recent of the improvements is to put a FLIR, forward-looking infrared fire control device to the Chaparral to provide it a night capability and also some adverse weather capability. Currently it is limited to day and fair weather and that is a pretty significant limitation. That development program is coming along just fine. We expect to be able to begin buying those kits in the next year or so along with a smokeless rocket motor, and you will notice there the signature that that smoking rocket motor leaves, and some other minor component kinds of life extension product improvements.

DIVISION AIR DEFENSE (DIVAD) GUN

The division air defense gun has been a unique program. We have called it a skunk works, if you will, because of the urgent requirement to get a gun out in the forward area of the division to replace again what was to be a temporary weapon system, the Vulcan. At the same time we took the Sidewinder we took a 20-millimeter Gatling gun that had been developed for aircraft and put it on a 113 and said that is all we will be able to have for a while.

Well, that while has now lengthened into 15 to 16 years. [Deleted.] So we began with Congress support a crash program to use two European proven gun-ammunition combinations, a 35-milliimeter Swiss Oerlikon and 40-millimeter Swedish Botors, fire control components from other defense programs for both radar and the computer and to integrate those onto an existing tank chassis. We are using rebuilt M–48 chassis to hold the cost down.

We gave each of those competitors 29 months to integrate these components and come to the O.K. Corral at McGregor Range, N. Mex., for a shootoff. We have completed that shootoff successfully and we are now in the source selection process.

The initial funding in the Carter budget has caused a 5-month delay in source selection. Fortunately in the amended budget that has been presented to the Congress there are enough dollars now to complete the maturity phase of development and to buy the first 50 fire units, the ammunition facility, and rounds of ammunition for those fire units.

Source selection should be completed and the contract awarded in the month of April.

Senator RUDMAN. The mission of that unit is against what type of aircraft?

HIND AIRCRAFT

General KEITH. For both fixed wing ground attack on forward armor mechanized units and the HIND. [Deleted.]

Senator RUDMAN. Isn't that very vulnerable to most kinds of ground fire?

General KEITH. The HIND, sir?

Senator RUDMAN. Yes.

General KEITH. It, like our attack helicopter, has a missile on it that allows him to stand off from the target he is attacking [deleted] kilometers. So you have got to have a gun or something that can reach out there and get him. He is not as good as our attack helicopter because of the fundamental design in the jinking. In the low-altitude popup and sideward lateral maneuver, that bird was designed as a high-speed troop carrier and it has evolved to an attack helicopter. But it carriers one heck of an ordnance load. It is twice as heavy, twice as big as our attack helicopter, like many things the Soviets do. But it is a formidable ordnance carrier.

So in order to get it we have got to have the ability to reach out there. That is really the case because he can stand off.

They also fly those things much like a fixed wing. They will come in on a strafing run and they actually put bombs on that thing. But more and more they are learning I think, as we did, from their experience in Afghanistan, they are a heck of a lot better off if they can stay in defilade, pop up, stand off, and get back in defilade, because if they do stay up they are vulnerable, as you suggest.

ROLAND

Roland has been throughout its life, as you gentlemen very well know, a controversial program. Again, in the early seventies we had a need for all-weather protection, low altitude of rear areas in Europe. In those rear areas we find the main operating bases for our Air Force, the storage sites for our forward deployed equipment, critical bridges and avenues for moving logistics forward from the corps rear.

Our motivation then was to get something quickly and so we went shopping on what existed in Europe at the time. We selected this Franco-German design and began with R. & D. dollars the transfer of that design to our industry so that we could build prototypes off of our drawings in order to have our own production base because we figured this is going to be with us for at least 20 years and we don't want to be beholden to an offshore production base that could be turned off in some unforeseen circumstances in the future.

The system has worked just as well as the brochures said it would. We have maintained the interoperability totally with our allies. This is being fielded by both the French Army and the German Army. We can fire their missiles and they can fire ours. We put this in an existing chassis. That chassis happens to be the one of our self-propelled howitzer, the M-109.

The module is built in sort of a square box that can sit down in it. We can also pull that module out and transport it separately by strategic lift for Rapid Deployment Force coverage if we wish. It could go on a trailer. It could go however. But the main line system is on that self-propelled chassis.

It has been up again and down again several times because of its relative expense, No. 1, and relative affordability within the total envelope of resources that the Army had. This year in the amended budget the dollars have been put in to continue the procurement that started 3 years ago toward our goal of achieving four battalions of Roland.

Senator KASTEN. General, what effect will the German cutbacks in the procurement of the Roland missiles have on overall NATO capabilities?

General KEITH. I can't give you a precise answer because I am not sure how they are going to apportion their production. The Air Force was buying some as well as the Army. The Army buy in

Germany and the Army buy in France are not being cut back. So there are over 300 fire units that are being produced off the European production line. Now, how they are going to adjust their deployments, Army fire units versus Air Force fire units, I simply don't know the answer to that.

Our production line is totally independent of the European production line, as I mentioned, however.

Senator **Kasten**. Their efforts or their changes will not affect our procurement here at all?

General **Keith**. Not at all. We established our own production capability at Boeing for the base fire unit and at Hughes for the missile and the radar portion. so we have our own production facilities.

STINGER

The last item is Stinger. We have in our inventory today an old heat seeking missile that is fired by individual soldiers down in maneuver units. In the infantry unit and the field artillery unit it is called Redeye. The problem is it can only fire at the tailend of an aircraft, that is the so-called revenge weapon because the seeker is not sensitive enough to be able to fire from the front as you are being attacked.

It also has the capability of handling only a [deleted] knot target. So we have had in research and development for some time now its replacement. It is called Stinger. It has an all-aspect seeker. You can fire from the front as well as side and rear. It has an identification friend or foe on it which the old Redeye did not and made our pilots a bit nervous. And it has the capability of handling targets up through [deleted] knots.

Stinger is now in production. The R.D.T. & E. again is to work one more refinement to the seeker that enhances its electro-optical countermeasure capability for the future.

[Deleted.]

There is a two-color IR and UV seeker that is following along behind the first generation here that can handle that kind of a countermeasure. So we are pursuing that.

The Stinger reached its IOC last month in Europe and we are glad to have it over there.

Senator **Andrews**. When you say you are pursuing that two-color heat seeker. That means that you don't have it yet and the ones that you are making [deleted].

General **Keith**. It must be very precise in [deleted]. The current Stinger seeker does an awfully good job on [deleted].

Now, you have got to remember though that these Stingers, they are a proliferated weapon and they are not an air defense unit. They are in the hands of infantry units, artillery units, and armored units. They are protecting themselves. They would have to come at every single one of these units [deleted].

So we feel pretty comfortable that while, yes, there is some susceptibility, it would make no sense in our minds to leave soldiers out there without old Red eye and they can't handle it at all and not put this second generation out there that will do [deleted] percent of it.

Senator **Rudman**. What is the range of that unit?

General **Keith**. My memory is that it is a little over [deleted]. I can get it precisely.

Senator **Rudman**. That is fine.

General **Keith**. Aviation now, sir.

ADVANCED ATTACK HELICOPTER (AAH)

Starting with the advanced attack helicopter, the AAH is the last of the Army's big-5 R. & D. programs from the 1970's to approach the production boundary. It is in the last year of research and development now. As you can see, we have an IOC of 1985 but we will actually make a production decision this coming December. I have to tell you that that IOC is dependent upon the first full unit equipped [deleted].

We have got to take the first production units and put them into the training base to do those first.

If we were to choose we could take those, that is in an emergency, and we could deploy them. So that IOC is definitional only. We will have a production decision in December of this coming year. You may remember last year we had a technical problem that we told you about that we were pursuing. It had to do with vibration loading in the aircraft because of the engineering design of the tail. We had to go back and redesign the tail of this aircraft making it look very much like the one that is on the Black Hawk. We have learned from the Black Hawk that you can reduce vibration in the transition from vertical lift to horizontal flight as you come in and out of hover which is its most critical point for firing the weapons on this system by having a so-called stabilator.

The horizontal elevator that you see on the tail of that airplane moves. So it now has optimal position for hover and optimal position for transitional forward flight.

Senator **Rudman**. Who builds that, General?

General **Keith**. Hughes Helicopter Co., sir.

That fix was very rapidly made and has been successful. The virbrational tolerances have been met with one slight exception. We had a spec for vibration at the pilot seat and at the gunner's set which was a very demanding one. We are very close to that spec and in fact we have put guys in it to do their job and have said we are not going to pay any more money for the last 5 percent because we don't need to. So we have met to our satisfaction all that needs to be done with that engineering fix.

The AAH weapons package has as its prime armament the Hellfire laser semiactive missile that operates very much like my description of the Copperhead round. It has a standoff range of a little over [deleted] kilometers. It is compatible with the laser designator that is onboard this aircraft. The target acquisition/designation sight allows the pilot to acquire autonomously, laser designate autonomously, and fire or he can have a scout aircraft with him, and this is a preferred option, that will allow him to stay completely in defilade with the scout to find the target and the scout to put the laser spot on and let him come up fire his mssile and come down and move over to another spot, come up and fire his missile and move over.

The aircraft design is one that optimizes its performance at the coming in and out of hover, lateral movement and avoiding being hit by that kind of maneuver as opposed to optimization for fast forward flight.

Its secondary weapons are a combination of free-flight rockets, 2.75's that we have in our inventory today that are on our Cobras. It has an improved fire control that allows those free-flight rockets to be more accurately delivered and also allows the 30-millimeter cannon with a very small shaped charge to be able to accurately attack targets that are thinner skinned than the main battle tank.

It is obvious that we would like to keep the 16 Hellfires that this fellow can carry for the tough targets and use the free-flight cheaper rockets for area targets and soft targets, and the 30-millimeter for softer targets like trucks and so on because it is more efficient from an ordnance point of view.

Senator **Rudman**. What is the approximate speed of that helicopter, General?

General **Keith**. The maximum speed is around 165 knots, sir. It is not a slow bird, but it is not optimized for speed.

Senator **Rudman**. I assmue that vibration specs on that have something to do with the aiming that has to be done from the cockpit?

General **Keith**. Yes, sir. There is a stabilization of the fire control as you are looking out at distances to be able to put that laser spot on.

Senator **Rudman**. And you are happy that even though the spec has not been reached that you are close enough and the system works and you won't come back in a year and say now we have to go back and fix the vibration?

General **Keith**. No, sir. We are not going to do that.

Let me clarify where I am talking about the vibration as being. Out in the chin, what we call the chin turret of that is where the fire control instruments themselves are carried. It is on a little turret that turns as the pilot turns his head. The vibration in the helicopter is tunable throughout the whole bird. It is almost a black art. You can put weights around and tune vibration out. You don't want to do that because it is burden weight unless you have to.

The point I am talking about is that vibration is still where the pilot is sitting and looking through optics. It is out on the chin with that spec and the pilot is able to do his thing.

Senator **Rudman**. Is that a turbine engine?

General **Keith**. It is a twin-pack turbine engine built by General Electric, a T-701. It is similar to the engine in the Black Hawk utility aircraft.

The Hellfire missile, as I said, is the main armament. It has been kept in development synchronization time-wise and it will go to the production decision at the same time that the attack helicopter goes, as you can see, tidying up the tailend of the R. & D. The first procurement request is for 1,075 Hellfires in the 1982 program to go along with the attack helicopters.

ARMY HELICOPTER IMPROVEMENT PROGRAM (AHIP)

The Army has been pursuing for some time a scout aircraft that can run with and fight with the advanced attack helicopter. As you will recall, we tried to launch a new development program for a fully modern airframe and the visionics that go with it to perform that function. We were not able to either get congressional approval or to afford, I might add, doing that while we were doing these other things. So we came back last year and asked for permission to take an existing airframe to do only that work which will allow it to operate in the environment of the Middle East, that is on the hot day, high altitude environment, and to put on it the necessary target acquisition designation sight so that they can do what I described with the advanced attack helicopter, and I might add also to be able to acquire a target and designate for the field artillery for the Copperhead, the same kind of a job to be done.

AHIP stands for the Army helicopter improvement program. We are about to go on the street with a request for a proposal that will be looking at two existing scout helicopters, the one built by Bell, the OH-58 and one built by Hughes, the OH-6.

From both of those competitors we will get a proposal to do the minimum upgrade in the rotor system to be able to perform on a hot day and through their subcontractors a proposal for a sight which will go up on the top of the mast of that helicopter to allow him to stay as much as possible in defilade and acquire targets to hand off to the attack helicopter or to the artillery to attack in depth.

The dollars that are in this budget are to do those two things that I described, both the rotor work and the visionics work and mast mounted sight.

CHINOOK

The CH-47D I put up there simply to give you the tailend of a success story. It is our only medium-lift helicopter. We have had various versions of this, A, B, and C versions, that have been produced from the early 1960's all the way through the 1960's in Vietnam. We took a look at the cost of replacing this bird versus simply rebuilding them in the factory. It is a product improvement but it is more than what you would normally do with modification kits in the field. We actually call it remanufacturing to make it a D model.

That program has been on schedule and on cost every inch of the way. There aren't too many of them that we can proudly say that about and we, as you can see, will be asking to rebuild 19 of the earliest A model Chinooks with the 1982 budget request.

BLACK HAWK

Finally, the Black Hawk is another developmental success story. That was the first of the Army's Big-5 1970 developments to come across the production boundary. It has been a development success all the way. We designed this bird primarily for low-cost of ownership to have high reliability and ease of maintainability so that we would get more flying hours per maintenance hour than any other utility helicopter that we have ever built. In fact, we have achieved that.

Senator ANDREWS. Why if these are so easy to maintain and so dependable and all of that weren't they the choppers that were picked to go into Iran? All we seemed to have were the Sea Stallions that were overaged and broke down and all the rest.

General Keith. I honestly am not privileged to know. That was a pretty close group.

Senator Rudman. What is the range of that helicopter?

General Keith. The range of that helicopter is less than the range that we had to have.

Senator Andrews. No; I am not talking just about the Black Hawk. I mean in the Army helicopter inventory it would seem that you have got a bigger bag of choppers than does the Navy. Yours are supposed to go close on the deck and hide down and defilade as you talk about and it would seem that in your inventory you would have some version that would make a whale of a lot more sense than those Sea Stallions that were overaged and gray and did in fact break down when they went through those desert sands.

General Keith. Let me tell you several reasons and then I'll have to say that I simply don't know how the decision was made. The inventory aircraft that we had available to be considered were the UH-IH Huey, which are as old or older than the Sea Stallions and clearly do not have the range even with a ferry kit, the CH-47 that I just talked to you about. We did not have the CH-47D models yet and the old A, B, and C's are not that noted for their reliability either. The D model is doing beautifully and a lot of what we are building in is reliability and maintainability.

At that time we had produced about the first 40 Black Hawks and just learning how reliable they were in the field.

Now, let me say that you can install an extended range kit in the helicopter cabin area rather than carry troops; however, this helicopter was designed to carry a full squad of troops, equivalent cargo loads, or external cargo sling loads up to 8,000 pounds with a fuel endurance of 2.3 hours. You can get ferry ranges that will allow this helicopter to self-deploy, for instance to Europe, augmenting fuel systems.

I believe that the decision embodied not only having relatively little experience with the fielded Black Hawks because we were early in the production phase but, more importantly, the launch place was from a Navy carrier. It seems to me that anybody that had an overhead capability, and the Soviets clearly do, could see those airplanes on a carrier deck and would think something was kind of screwy.

Senator Andrews. Why weren't they shipped down on the hangar deck?

General Keith. My understanding is that they had them up and practiced and did a lot of things. But I honestly don't know that, sir. As I said, I was not a participant in that decision process. I am only offering conjectural reasons why they may not have chosen to use this bird.

The Black Hawk did go on exercise Bright Star after we got the first companies equipped in the 101st Airborne Division (Air Assault). You probably will recall the exercise we just had with the Egyptians in the desert. This aircraft went with that battalion for that desert exercise and performed absolutely beautifully. We believe we have a real winner with the Black Hawk.

The UH-60 engine particle separaters worked extremely well in the sand environment. The main problem we experienced was the erosion of the motor blade tip caps due to continuous operation in the sand environment. We are developing some very simple fixes for this problem and should have a final solution shortly that will protect the wear on the tip caps.

Senator STEVENS. General, let me interrupt you, if I may.

General KEITH. Yes, sir.

Senator STEVENS. I am trying to keep track of why we are in secret session here. As I look through the balance of your statement there are only three bracketed items. Is that correct. There are only three more things that are classified in this briefing? I am of the opinion that not a lot of this has been classified and there is no reason for this classification so far today.

General KEITH. There have been some items——

Senator STEVENS. It is just the stuff that is bracketed, isn't it?

General KEITH. Yes, sir, but I have felt absolutely unconstrained to answer any and all questions and it gets a little difficult if I have to think——

Senator STEVENS. I understand. We can ask questions and if we have to go into closed session then you can tell us that it is secret in the answer to us or you can somehow give us that information.

I just walked down the hall and there is a whole hall full of people waiting to get back in here. I would prefer, and I don't know what the other members of the subcommittee believe, but I would prefer that you let us know what is classified and then get back to where it is not classified. In my opinion we should not be in executive session the whole morning unless there is something I don't understand. What is classified about this part of it?

General KEITH. Nothing, sir. Nothing that remains. We have just finished it.

Senator STEVENS. Is there anything else that is going to be classified in the aviation section or the helicopter section?

General KEITH. We are done with the aviation section, sir, unless you have questions obviously.

DESERT SHIELDS ON HELICOPTERS

Senator STEVENS. I want to know about those desert shields that were on the helicopters that weren't on the Navy's version at the time of the Iran attempt. Have we standardized our helicopters now with the Navy's so that won't happen again?

General KEITH. The Navy has certainly gone to school on our experience in the desert I believe, sir. What we learned was improved abrasion protection is required on the leading edger of the main rotor blade tip caps and outboard sections of the tail rotor blade. I do not know enough about the rotors on the various Navy aircraft to know whether they have a problem that needs solving or not.

Senator STEVENS. May I ask you again what is classified?

General KEITH. If you would like to open what is left, sir, all we have left is the command and control intelligence part. I can try to avoid any of the classified if you would prefer.

Senator STEVENS. Well, I don't see any classified. I just looked through it.

General **Keith**. No, I mean in response to your questions, sir.

Senator **Stevens**. I see.

Gentleman, do you have any classified requests?

Senator **Rudman**. Well, I don't recognize obviously at this point here whether it might be classified or not, but if it is I am sure the general will inform me.

General **Keith**. I will try to keep my head screwed on straight, sir, so I can recognize it.

PREPARED STATEMENT

At this time I would like to insert into the record my prepared statement, developed under the constraints of the Carter budget.

[The statement follows:]

DEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF
FOR RESEARCH, DEVELOPMENT, AND ACQUISITION
WASHINGTON, D.C. 20310

2 March 1981

To the Reader:

My opening statement was sent to press at a time when the resource envelope for the Army's Research, Development and Acquisition (RDA) budget was severely constrained. During the past several weeks the new administration has made a number of very significant changes and on 27 February the Army's FY 82 Revised President's Budget was finally approved. My grim assessment of what we would not be able to do with the resources within the basic FY 82 budget is no longer valid. Within the revised budget we have increased our total RDA dollars from $13.5 billion to $19.0 billion. That increase funds the most serious shortcomings that I previously said existed. Specifically, we are in much better shape in such programs as the M-1 Tank, the Infantry Fighting Vehicle, Patriot, DIVAD and Roland, to name but a few. If we are allowed to maintain this momentum into the outyears, we will be able to modernize our Army at a much faster rate. We need your continued support.

Donald R Keith
DONALD R. KEITH
Lieutenant General, GS
Deputy Chief of Staff for Research
Development and Acquisition

PREPARED STATEMENT OF LT. GEN. DONALD R. KEITH

DEPUTY CHIEF OF STAFF

RESEARCH, DEVELOPMENT AND ACQUISITION

INTRODUCTION

It is a pleasure to appear before this committee once again to describe the Army's proposals to equip and arm itself. Today, we are presenting you with a research, development and acquisition budget request for $13.5 billion dollars. Within this funding level we have tried to meld a balanced investment in near-term readiness, modernization, sustainability, and mobilization capacity. There are significant shortcomings in each of these areas that we would like to cover with you today, as well as the progress we are making.

The international turbulence which has marked the last two years has underscored the need for the Army to be, and be perceived to be, ready to succeed in a wide range of missions. We must be equipped to meet our defense commitments in Central Europe, without sacrificing the flexibility needed to meet threats to vital US interests in other parts of the world. The Army is now short a great amount of equipment it is authorized and much of the equipment on hand is not able to counter the current threat. We would like to

Chance to overcome obsolescence and equipment shortages

fill the shortages, as well as replace obsolete equipment, with the modern equipment available from our successful research and development programs of the 70's. This equipment provides a quantum improvement in performance over older systems. This allows us the chance to bolster equipment posture in every equipment area in the quickest and, in the long run, most affordable way. It is vital that we closely evaluate each equipment area with you to ensure that a sufficient rate of progress is being made at this demanding time in our nation's history.

Near and long term modernization

Modernization, in the near-term sense, means fielding new systems that are at or near the procurement stage. In the long-term sense modernization refers to planning and developing new systems to respond to future threat projections and desired future capabilities. The need to plan for both near and long term modernization requirements, in a precise and all encompassing way, is a demanding and critical process in a period of constrained resources. We have been strengthening our long range planning and would like to discuss this effort with you.

US-Soviet trends: past, present, future

Our requirements must be, in large part, determined by the increasing threat posed by the Soviet's present and projected equipment posture. At the present time there is not one major comparative US-Soviet tactical equipment trend running in favor of the US. We can, however, reverse the qualitative disparity if we buy the equipment developed for that purpose during the decade of the 70's. We have based our acquisition strategy on acquiring high quality weapon systems that would enable our Army to defend against and hopefully defeat numerically superior forces. If we can do this, we are in fact a credible element of national and international deterrence.

The qualitative edge we possessed in weapons systems slipped away from us in the 60's and early 70's as Vietnam diverted our attention and resources. The Soviets technologically exploited this windfall period to catch up and surpass us in equipment quality. They also built an immense warm production base that has not only modernized Soviet forces but has produced large quantities of high quality equipment for export to other nations. In spite of strains on their sagging economy, the Soviets show no evidence of deviating from their goal of increasing military supremacy and extending qualitative superiority in fielded equipment.

There was much debate in the 70's as to what the Soviets were up to with their relentless military buildup. One view put forth was that the Soviets were intent on "defensive entrenchment, "a notion summarily shattered by the Soviet invasion of Afghanistan. Troops are now being shuttled in and out of Afghanistan in what has become a training ground for combat soldiers and a proving ground for Soviet equipment.

The speed and surprise of this invasion--over 80,000 troops deployed within several days--is also worth noting. It was carried out in a far swifter, bolder, and more efficient manner than the 1968 Czechoslovakian invasion. It has long been our concern that the Soviets would use military exercises in Warsaw Pact countries as mobile leverage points for a surprise "roll off" attack on NATO forces, *Geographical advantage*

giving us little warning time to muster a credible defense. As we went to press, this method was being used by the Soviets to intimidate their own reluctant allies, the people of Poland. Massive numbers of Soviet troops and equipment have been mobilized and military "training" exercises are being conducted in Czechoslovakia, a few miles from the Polish border. The fact that the Soviets are right on top of their potential theater of operations is a factor we must reckon with over and above qualitative and quantitive comparisons.

Soviets pursue a fixed course

The Soviet's willingness to project their military muscle stems in no small part from growing confidence in the superiority of their equipment posture. It is no mystery how the Soviet's achieved this superiority. They outspent the US by an estimated 240 billion dollars in the production of military equipment in the 70's. Their modernization encompasses all classes of equipment and all areas of combat and support. The Soviets have chosen to run at their own pace in what must be called a one sided arms race. Whether we like it or not we must complete or forfeit the ability to control our destiny. That demands an adequate resource base and more efficient use of those precious resources.

Equipment shortages

Our equipment shortages hit us in virtually every mission area. As we noted earlier, our new systems are intended to replace more or less on a 1-for-1 basis, the systems that are in the field. For example, if we are short an M-60 tank, we need to either produce another M-60 tank to fill the shortage or, preferably, fill it with a new XM1 Abrams tank because of its greatly increased performance.

There are both military and economic advantages in filling these shortages with the modern systems we now have available. First, they are not just marginal replacements. For example, the Abram's tank more than doubles the performance of the M-60 tank, and the Black Hawk helicopter far outperforms the UH-1 "Huey" helicopter. Without exception, our new systems greatly exceed in performance the systems they are designed to replace. Some of our other new systems, such as the Multiple Launch Rocket System and the Copperhead missile, will introduce entirely new capabilities in the force.

New systems are easy to operate and maintain

A concern that is voiced from time to time is that the more sophisticated new equipment will be more difficult to operate and maintain. In fact, the reverse is true. We have paid a great deal of attention to human factors engineering during the development phase and have used technology to make our equipment easy to operate and maintain. Operational tests of the Abrams tank, the Infantry Fighting Vehicle, the Multiple Launch Rocket System and other new items have confirmed that average soldiers found in operational units can indeed efficiently operate and maintain the systems. We are also using technology to assist support units in higher echelons of maintenance and repair. Automated test and diagnostic equipment greatly simplifies fixing the modules that the operational units have removed and replaced.

The costs for these new systems should also be set in perspective. As you are well aware, there is a painfully high near term investment necessary to field this equipment. However, the costs of equipping the force with modernized equipment is

Costs in perspective

only marginally higher in life cycle terms than equipping it with older equipment. There are maintenance and support problems created by the age of present equipment which result in high operation and maintenance costs. Most weapons systems now in the field were designed during the 1950's and are in many cases older than the troops operating them. Most of this obsolete equipment is also manpower intensive. The manpower we will eventually save by replacing aging equipment with new systems will in some cases create additional manpower for other uses.

Managing the procurement "bow-wave"

The most pressing barriers to fielding our new systems and doing so in sufficient numbers, are now primarily financial rather than technological. We were aware we would face affordability issues when our new systems emerged from research and development in the seventies but our program projections seemed adequate to cover our highest priority needs. Our difficulty in efficiently procuring a large number of new systems coming into production at the same time created the so-called bow wave problem. This in turn was exacerbated by inflation, rising energy costs, and long material lead times. Inflation is no stranger to any sector of the economy, but it has hit the Army extremely hard. One question brought out during last year's congressional hearings was why inflation, and the resulting cost growth, hit one system harder than another? In the specific case in question, a relatively large amount of aluminum was used to build the system and the cost of aluminum had skyrocketed, in fact, about a factor of 3 over the cost of steel. Obviously, rising material prices are only one aspect of system cost growth; the point here is that such unpredictable and seismic "fluctuations" in our economy make it very difficult to make accurate near or long term financial projections.

Largest peacetime modernization effort

It should be noted, however, that our bow wave "problem" is in fact a source of resilience and strength. We could not be planning to reverse any Soviet-US equipment trends if our equipment was still on an engineer's drawing board rather than at the procurement stage. As it stands, we are involved in the largest peacetime modernization in history. Bow waves, of course, are certainly not unique to the Army; the Under Secretary for Defense, Research, and Engineering testified during last year's hearings that he has a tactical and strategic bow wave problem throughout all of the services in the Department of Defense. Considering the state of the economy and the fact the Soviets outspend us year after year it is hard to see how it could be otherwise.

Value of new systems based on teamwork

Clearly, we do not want to emulate the Soviets, who have ransacked their economy to amass large quantities of military equipment. We depend, rather, on a small quality Army capable of holding its own against one with superior numbers. This concept, it should be stressed, is based on the combined power of our new weapon systems. We have designed our new equipment from the outset to work together on a combined arms battlefield. That synergism makes the sum of the parts greater than the individual contributions of the components. Conversely, weak links make for weak chains. We therefore have not chosen to buy a few things rapidly while other needed components of the force go unfulfilled. If resources permit us to buy a balanced package of equipment for our highest priority units, we can build the leading edge of the quality Army we must field. The rate at which the balance of the force is modernized depends on the resources made available to us over the next few years.

Risks at stake

In our systems overview, we try to inject some of the tactical rationale, and synergistic benefits of our new systems. These snapshot descriptions convey only a small part of the advantages and risks at stake, so perhaps a qualification is in order. To cite just one example, we describe the Copperhead laser guided artillery shell as a devastating new tank killer, the first indirect fire, precision guided munition in history. While this is fortunately true, we are now producing fewer Copperhead missiles per month than the Soviets are producing of their far more expensive tanks. It is just such imbalances that make or break Armies. Quality, in short, can never be a complete substitute for quantity.

An alternative to producing a balanced package of equipment is to kill some items in order to buy a lot of the rest. This is a formula for disaster on the battlefield. The Army has already made some tough pruning decisions and the systems we have decided to fund are those whose absence will pose what we believe to be unacceptably high risks. That is, their absence would not only remove a particular capability, but have adverse impact on those that remain.

Our proposal to produce all of our new equipment at a prudent rate will yield another important dividend - the beginning of a modern responsive industrial base for mobilization. Even with this warm production base we are running risks since facilities have been mainly sized for peacetime production rates. Thus, we do not possess the surge capability for production required in emergencies. Without this warm industrial base, however, we would need at least 2 years before we could even begin to produce a new system.

Improved long-range planning

There are shortcomings in our industrial base and in the ability of private industry to respond with the required surge capability in the early phases of a wartime emergency. We are studying a number of near and long term measures to build more resiliency into the mobilization base, some of which may require congressional action. We would like to discuss these actions in the context of our new approach to long-range planning, which should provide considerable stability to the materiel acquisition process. It has been, in part, a lack of stability and continuity in defense programs that has disrupted industry's ability to plan and discouraged larger capital investments. The excellent report by the House Armed Services Committee Defense Industrial Base Panel, December 31, 1980, clearly identifies much of what must be done.

Our fundamental problem, of course, is to lay out a materiel acquisition strategy that satisfies near term readiness demands while concurrently placing us on the proper azimuth to achieve the Army required in the 90's. And we must do this within a realistically achievable resource envelope.

Looking to the future

First a broad perspective is needed, a vision if you will, of what kind of Army we want 15 years from now. Our Operations and Intelligence Personnel and the rest of the Army are helping to do this now. Everything must then be measured against those goals. If we can identify projects that will yield the highest payoff to specified force requirements, and then support them through the acquisition process at an optimum pace, we will be providing the best fighting Army for each dollar spent in the acquisition process.

What is new in this enhanced planning process is that it allows us to capture the best data available on the future in as all-encompassing a way as possible. We are looking out to the year 2000 to determine what kind of an Army we think we will need. Those needs, then, provide the focus for the application of technology in the development of new and improved Army systems. We want to be able, for example, to pick a year when production of a system should begin--based on a specified force requirement--and then backward plan for when development must begin, and further backward plan to decide the point in time where technology base homework must begin. We must then validate the individual system in relation to its impact on total Army requirements as it moves through time. The early linkage of RDTE and procurement programs will help us reduce false starts and program stretchout.

Planning according to mission area requirements

Research, Development and Acquisition planning will also be linked early and continuously with doctrine, training, and force structure requirements to permit coordinated advances across all mission areas. This approach will counteract any tendency to view a weapon system in functional isolation. For example, if we decide to develop a new surface to surface weapon system we need to consider early on what kind of target acquisition and command and control elements are needed to support it. If we choose a precision guided munition as the primary long range attack system, for example, the target acquisition system capabilities need to be quite different from that necessary to support a conventional surface to surface weapon system.

The long range RDA plan must be flexible since it takes such a long period of time into account, but we think it will counteract a tendency that has concerned both Congress and the Army. That is, it now takes too long to develop and field our systems. The insights gained from this planning process will help us to decide more precisely when system design should be "locked in" for production, when the pre-planned post-production block improvements should be incorporated and, for the long range, when entirely new or revolutionary systems should be expected and planned for. We will elaborate on this in more detail when we address the technology base.

Reliance on industry

The increased stability and continuity which accrues from improved long-range planning will also help industry do better planning. As a customer in the market place we need to ensure both their needs and ours are met. The teamwork this entails has been in play as the Army developed its long range planning process.

We mentioned earlier that by producing all of our new systems we are increasing the ability of industry to expand to surge production levels, but that these facilities will still not be sized to provide the quantities we will need during mobilization periods.

We not only rely on the private sector for finished products but for materials and components for use in government owned facilities. The long lead times required to procure some critical materials is one of the root problems in the ability of both industry and government facilities to produce equipment faster. The Army has been working closely with leaders from all segments of industry to alleviate such problems and develop ways to build more resiliency into the mobilization base. This is an area of keen Congressional interest, and we would like to convey some of the recommendations and measures that grew out of a recent meeting with members of industry during MOBEX 80. First, a short review of the state of the government owned industrial base is in order.

Government owned base

Our present government owned base is primarily a hold over from a much larger base established for World War II requirements. Although these facilities were sized to produce mobilization quantities, many of the older items are not in production or are being manufactured at a low rate (many for foreign military sales). In addition, many of the facilities are in layaway or deep standby and many of the component suppliers have left the business. Reactivation of these old facilities and equipment, in peacetime, would also require actions to comply with environmental and occupational safety and health requirements. Even so, facilities now in layaway would be able to provide hardware and ammunition far sooner than if we had to start from scratch, since new plants that take about 5 years to construct in peacetime will still require 24 months or longer in an extreme emergency. Preservation of this reserve capacity is thus essential to long-term sustainability of the force.

Insufficient war reserve stocks

One fact should be stressed at this point concerning our war reserve stocks, which are now less than needed for nearly all items. Our industrial base was never intended to compensate for inadequate war reserve stocks in the early stages of a war. As it stands, our nation would have to forecast when hostilities would begin so that commercial and reserve industrial base facilities could be converted/reactivated and be producing in advance of hostilities. In the face of quickly developing hostilities, we would be forced to redistribute existing assets to fill shortages in deployed or early deploying units and take a number of other stop gap measures. The Soviets, because of their equipment posture, are much better prepared for a compressed, attritive war.

Working with industry: MOBEX 80

Considering the current status of war reserve stocks and the need for long term sustainability of the force, increased attention must be given to improving the capability and responsiveness of the country's industrial base. During the recent mobilization exercise, MOBEX 80, the Army hosted thirty Chief Executive Officers from industry who offered numerous recommendations for improving the posture of the industrial base. Perhaps the single most important requirement that surfaced was the need for a clear statement of national policy on the role the nation's industrial base must play in supporting the nation's readiness posture. Included in this policy should be the tradeoff, or balance, desired between war reserves and the responsiveness of the industrial base. The industrial preparedness planning system could then be revised, improved and, hopefully, adequately funded. To increase the responsiveness of the industrial base consideration should also be given to improvements such as:

o Increase Federal stockpiling of critical raw materials, and increase research and development of substitute materials.

o Stockpile enough critical components at current producers' plants in order to reduce leadtimes for end items up to the full surge capacity of the plant.

o Increase the use of multi-year contracts to encourage private capital investment by providing needed planning stability and reducing financial risk.

o Provide "Dormant Contracts" with industry for the production required to meet the Army's needs.

o Encourage formation of capital for investment in modern production facilities through tax incentives and reduced regulatory hinderances.

o Improve productivity and reduce technical risk through the Manufacturing Methods and Technology Program (Spillover into commercial sector is expected).

o Government and industry work together to identify skilled labor shortages and develop training/apprentice programs to overcome them.

Many of the recommendations that grew out of MOBEX 80 will provide the Army with a firm base from which an action plan can be developed. However, the valuable insights gleaned from MOBEX 80 were provided too late to have a meaningful impact upon the 1982 President's Budget. Our proposed industrial preparedness operations account has been reduced by 21% (not considering inflationary impacts) and many of the improvements to the industrial preparedness program that were initiated in FY 1979 at the insistence of the Congress must be curtailed. Specifically:

o Maintenance of our reserve Government-owned plants must be deferred permitting the bare minimum for security and utility expenses.

o Initiatives to improve our planning with the commercial sector for emergency production must be deferred.

o Measures to enhance the response time of reserve industrial facilities must be deferred.

We turn now to the highlights of the Army's Research, Development and Acquisition request. Within the resources available it represents a reasonably balanced program, but we are concerned about the pace at which we are producing and delivering badly needed equipment to our soldiers. Our relative position vis-a-vis the Soviets continues to diverge. We have chosen to cover our program by functional area for clarity and understanding.

TANK-ANTITANK WARFARE

The main offensive weapon of both the US and Soviet ground armies is the tank. Supported properly, tanks can dominate the battlefield, spearheading the offensive, killing other tanks, devastating "soft" targets, and driving through defensive positions with massive momentum.

Soviets invest heavily in tanks

Assessments of the tank's value in combat invariably point out that they create shock and panic on the battlefield, even beyond the great danger they actually present. In an example of what they call "tankophobia," the Soviets have described troops--armed with anti-tank missiles--nervously and prematurely opening fire, thus revealing their positions. They warn their soldiers, in parable terms that if they run away from a tank, the tank will grow and become a giant. The Soviets continue to express their faith in the tank in assembly-line terms. They have fielded 3 new tanks since 1960, the T-62, T-64, and T-72. The T-80 is in the late stages of development and a follow-on successor to that is undoubtedly on the drawing board. In short, there has been a continuous upgrade to a mixed Soviet tank fleet which numbers approximately 45,000.

Advanced armor versus ATGMs

Advanced armors being used in Soviet tanks are also of concern to us since we rely heavily on anti-tank guided missiles to offset our numerical inferiority in tanks. The Soviets now outnumber us 4 to 1 in tanks. For this reason we would like nothing better than to relegate the future of the tank to the Smithsonian institution. Unfortunately, the prediction that improved anti-tank guided weapons would sound the death knell of the tank has proved to be premature. Recent breakthroughs in armor technology have given tank designers a trump card of their own. It is not our intention to try to survey the ramifications of this fierce technological tug-of-war on future tank-antitank warfare. However, we think it is in order to briefly review the broad impact on our current anti-tank weapon systems.

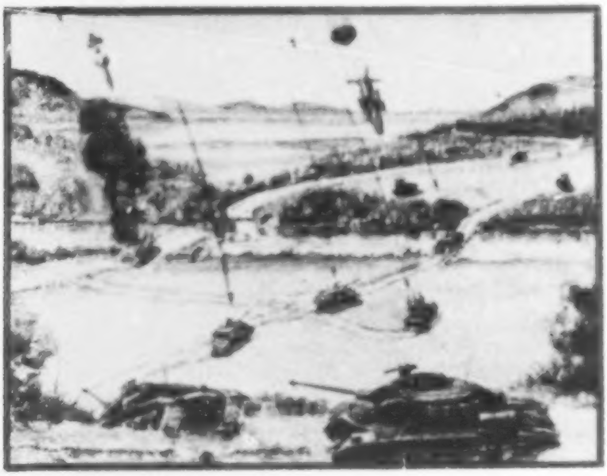
The use of shaped-charge warheads, in such missile systems as the TOW and DRAGON, is one source we have for defeating armor. This same technology is used in one type of tank main gun ammunition. Once the shaped charge detonates on impact, a stream of hot metal and gases burns through the armor like a cutting torch and continues on inside the tank. However, new armor technology has degraded the effectiveness of the shaped charge, in effect raising the ante. We can use new technology to improve the warhead to keep it lethal, and we are doing this with the TOW wire-guided missile.

The effectiveness of kinetic energy penetrators fired from tank guns has also been degraded by new armor. Consequently, new designs that are ever more lethal have ensued. The cat and mouse game between armor and munitions seems never ending and the stakes are high.

An important factor in anti-tank warfare is that tanks have often been capable of negating the kind of battlefield conditions that make anti-tank warfare successful. In short, they have proved better survivors. For this reason, precision-guided munitions with a high single-shot kill capability--such as COPPERHEAD and HELLFIRE missiles--are of premium value.

Future anti-tank weapons

The application of improved sensing devices in combination with precision munitions gives us many promising possibilities for future anti-tank weapons. We have already tested, for example, the Search and Destroy Armor (SADARM) concept, which gives us an exciting new top-attack method of destroying tanks.



SADARM

SADARM: top attack approach to killing tanks

Improved sensing submunitions are fired from a standard artillery projectile over a target area containing armor targets. Each submunition is affixed to a small parachute which enables the sensing device to search the area for targets. Once detected, a kinetic-energy fragment warhead is fired at the top of the tank where the armor is thinnest. This technology gives us a fire-and-forget capability, with the sensing device serving, in effect, as a combined forward observer and target designator.

The type of technology represented by SADARM gives us potent possibilities for future anti-tank weapons. However, in terms of recent battle history, the tank itself has been the primary tank killer and that is cause for immediate concern. Until the Abrams tank is deployed, we lack a main battle tank with the survivability features necessary to stand up to increasing numbers of improved Soviet tanks and anti-tank weapons.

XM1: christened the Abram's tank

It is in this highly-charged context that the new Abrams tank--which is now in a low rate of production--has emerged and attracted much attention. The Abrams is the most powerful, mobile, and survivable combat vehicle ever to be developed by the US and we think it outperforms any fielded tank in the world.

XM1

The attitude of the soldiers who have been operating the Abrams tank was summed up by one tanker who said, "If a man wants to stay in the Army and he wants to be a tanker, this is the tank he wants." The Committee is aware of the capabilities of the Abrams tank but they are important enough to our readiness posture to bear brief review.

Mobility

The agility of a tank is a major element in the effectiveness equation. A 1500 horsepower turbine engine supplies the Abrams with double the power of M60's diesel engine. Its stabilized sighting system ensures that speed is combined with accurate firepower. Tankers are able to routinely hit 5-foot targets over a mile away while bouncing over an obstacle course like a dune buggy.

Accuracy

This kind of on-the-move accuracy is made possible by the design features of the fire control system. The gunner puts his sight on the target and ranges using a laser rangefinder; a solid state computer automatically determines the ballistic data and adjusts the lay of the main gun; the gunner need only squeeze the trigger to score a hit. In operational testing the Abrams proved twice as capable of scoring a first round target hit as a standard M60A1 battle tank.

The main armament of the Abrams tank is the 105mm rifled gun that will fire improved kinetic energy rounds. To keep the Abrams main gun system lethal against improving Soviet armor, later versions will incorporate the German designed-US manufactured 120mm Smoothbore gun. This will enable us to defeat the Soviet tank threat beyond the 80's. First production deliveries of tanks fitted with 120mm guns are scheduled for August of 1984.

XM1

Survivability

The future battlefield will be thick with anti-tank weapons designed to provide tanks with short lives. The Abrams tank is protected by a special type of advance armor and its low silhouette and raw speed will reduce its chances of getting hit. But, if it is hit, a number of revolutionary safety features, including an automatic fire extinguishing system and armored compartments that separate the fuel tanks and main-gun ammunition from the crew, will greatly enhance crew survivability. In order to spot an enemy tank at night, tank crews must ordinarily give their position away by using a searchlight of infrared light. The Abram's thermal imaging system is a passive device and will thus give tank crews an important "stealth" feature. The Abrams will be able to go 1500 miles without maintenance services versus 750 miles for the M-60, a feature which adds staying power to the Abram's round-the-clock fighting capability.

Block improvements program

With Abrams and its running mate the Fighting Vehicle Systems, we are launching the use of a new concept for the Army - making preplanned block improvements to our major weapons systems in order to keep pace with the threat and postpone the need for entirely new systems. Planned upgrades include the 120mm gun, better chemical and radiological protection, an auxiliary power unit to save fuel and main engine wear, and reduced infrared, noise, and acoustic signatures.

Since we can't replace our entire fleet of M-60 series tanks with the Abrams tank in the foreseeable future, we need to upgrade that series to extend its

M60A3

Upgrading M-60 series tanks

useful life well into the 1990's. The M60A3 modification improves its main gun lethality by the addition of stabilization equipment which allows it to fire on the move, and outfits it with a laser rangefinder and solid state electronic computer which permits increased main gun accuracy. We are currently deploying tanks from new production and conversion but there are no funds requested in FY 82 to continue this vital upgrade.

Fighting Vehicle Systems

As fully-integrated a fighting system as a tank is, it can no more operate autonomously on the battlefield than an aircraft carrier can at sea. Accompanying the Abrams tank in battle will be the Fighting Vehicle Systems (FVS), namely, the Infantry Fighting Vehicle (IFV), and its variant, the Cavalry Fighting Vehicle (CFV). They bring a whole new dimension of firepower and mobility to the Army combined arms team.

Infantry Fighting Vehicle

The IFV provides vastly improved cross-country mobility, firepower, and armored protection to the mechanized infantry squad. When moving into intense combat situations, the tank-infantry formation needs to be supported by continuous and accurately aimed fire-on-the move. The primary weapon of the IFV

IFV

is a stabilized dual-fed 25mm automatic cannon. The commander or gunner can instantly select either 25mm high-explosive or armor-piercing rounds. The high-explosive round can destroy unarmored gound targets out to 2,500 meters, while the armor piercing rounds are capable of penetrating the Soviet BMP. The two-man turret also has a two-tube TOW missile launcher and a 7.62mm coaxial machinegun. The TOW gives each squad the capability to engage enemy tanks at long range when in a defensive situation.

The Cavalry Fighting Vehicle (CFV) is identical to the IFV, except for minor modifications for crew size and equipment. The IFV carries a nine-man infantry squad team and has six firing port weapons. The CFV carries a five-man scout team and provides the cross-country mobility and mounted firepower necessary for armored cavalry and battalion scout squads to carry out reconnaissance, security and economy-of-force operations The FVS has an inherent swimming capability and is air transportable in either the C-141 or C-5A Aircraft.

We have described the FVS's important role in improving our base of fire and expanding our tank-killing capability, but its role in transporting our infantrymen into battle is equally important. The M113A2 Armored Personnel Carrier can no longer adequately handle that mission. Although inherently an excellent vehicle, which will remain in service indefinitely for many other purposes, the M113A2 must be replaced by fighting vehicles able to meet the Soviet threat vehicle--the BMP--head-to-head and win.

M113A2

Replacing the APC

Compared to the IFV, the M113A2 is slow, thinly armored, and mounts only a 50 caliber machinegun on a totally exposed mount. The troops inside sit idle, unable to tell whether sounds of fire are friendly or hostile and just as unable to respond to attack without stopping and dismounting. The IFV's vision blocks, through which the crew can view the battlefield and fire port weapons (modified M16's), permit close and continuous contact with the enemy while on the move. Once outside the vehicles, troops can move toward the objective supported by a high volume of firepower.

FVS cost reduction efforts

We and the Congress have been concerned with the cost of the FVS and an aggressive cost reduction effort is underway. It involves introducing competition into the program to the maximum extent practicable, value engineering, and manufacturing technology initiatives. The Army expects 100 vehicles to be procured in FY 1981 with an additional 300 or more in FY 1982. The first mechanized infantry battalion will be equipped in October 1982 at Fort Hood, Texas.

Attack helicopters

We move now to our Attack Helicopters. A ground attack on our forces in Europe will be spearheaded by masses of armored vehicles. Soviet doctrine stresses building overwhelming momentum with blitzkrieg-like tactics. Frontages in Europe demand that we concentrate on their main avenues of approach and counter quickly with an active defense. Our Attack Helicopters will be able to fly quickly across a wide front to strong points where they can disrupt the attack long enough for friendly armor and ground units to arrive. Attack ships can first saturate an enemy column with multipurpose rockets--degrading the enemies front line air defense weapons--and then fire tank killing missiles. This type of early quick-strike capability is vital in sparking the active defense of the combined arms team.

COBRA/TOW: a tank killer

The value of attack helicopters was first shown in Vietnam where the AH-1G COBRA had considerable success against lightly armored vehicles. In addition, the TOW was put on the Huey helicopter and knocked out a number of North Vietnamese Army tanks. After Vietnam, the TOW wire-guided missile was mated with the AH-1G to produce the COBRA/TOW, or AH-1S, making it a tank killer. While an effective weapon, the AH-1S is limited in engine power and largely limited to fair-weather and daylight operation. The 8 TOW missiles the COBRA/TOW carries are wire-guided so the launching aircraft must keep the target in its crosshairs until missile impact, necessitating exposure to enemy fire.

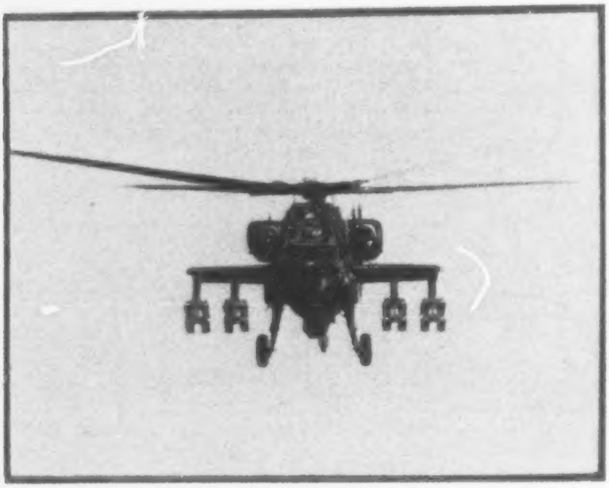
COBRA/TOW

Advanced Attack Helicopter

The COBRA/TOW performance limitations, and the realization that attack helicopters would play a critical role in winning a future land battle, led to the development of the Advanced Attack Helicopter (AAH). The AAH is the Army's first attack helicopter specifically developed for the day, night, adverse weather antiarmor mission. A fully integrated weapon system of the first order, it can fight world-wide and survive. The AAH carries 2.75-inch free-flight rockets and a 30mm cannon for attacking troop formations, trucks and lightly armored vehicles. Its primary mission, however, will be to kill tanks. The AAH will be able to destroy up to 16 tanks per sortie using its HELLFIRE missiles.

Mode of operation key to surviving

AAH's will fly at ground level, picking their way through trees and terrain features. Once in attack position, the AAH can laser designate targets or engage targets designated by another helicopter or ground element. They break cover by popping up or out from their covered firing positions just enough to engage and then re-mask. They move from firing position to firing position, minimizing exposure and striking opportunistically.



AAH

When targets are laser designated by another source, the AAH can fire its HELLFIRE missiles without exposing itself at all. Scout helicopters, equipped with sights and laser designators atop their rotor masts, will be able to spot and laser designate targets without breaking mask and the AAH can ripple-fire at multiple targets while remaining completely hidden.

AAH: also a deadly night fighter

The AAH retains its guerilla-like flexibility in adverse conditions or total darkness by using its Target Acquisition Designation Sight and Pilot Night Vision Sensor (TADS/PNVS). These devices give the pilot and co-pilot/gunner a clear picture at night and when the ground is blanketed by dust, smoke, fog, or rain. Once the pilot places his sight on a target, the cross hairs will stay there automatically.

This type of versatility is necessary if our aviators are to fight and survive on a modern battlefield. When the AAH is fielded it may well become the most lethal anti-armor weapon in the US inventory. It will outfly and outshoot anything in the Soviet inventory. The Soviet HIND, now operating in Afghanistan, is superior to our AH-1S COBRA, but it is no match for the AAH. The AAH is nearing completion of a successful engineering development program.

Modernized COBRAs

The AH-1S COBRA/TOW has been continuously upgraded to improve its safety, survivability and operational capability. We are product improving it further to give it a limited night and adverse weather capability and to make the system completely compatible with the improved TOW missile. While these improvements have enhanced its effectiveness and survivability against armor, the COBRA remains essentially a daytime helicopter with limited performance capabilities at high density altitudes and on hot days. The opening stages of battle are too crucial to be decided by performance limited COBRA's alone; however, you are asked to continue your support of these attack helicopter programs. Modernized COBRA's will provide our force with an urgently needed heliborne anti-armor capability until the more capable AAH arrives and will remain in our inventory well into the 1990's. The FY 1982 budget provides continued procurement of survivability improvements for the AH-1S and to develop and procure an enhanced TOW missile system with Forward Looking Infrared (FLIR) capability. We have no funds in our budget this year to modernize our early model AH1-Ss.

Scout helicopters are combat multipliers

Earlier, we described how scout helicopters reduce the attack helicopter's vulnerability by acquiring and lasing targets for it. Scout helicopters also enable attack helicopters to conserve fuel and ordnance so that they can devote their combat power to killing enemy armor. The current scout, the modernized OH-58C, can perform acceptably alongside the AH-1S COBRA--both having limitations in performance and in night and adverse weather conditions. However, it does not have the advanced systems compatible with the capabilities of the AAH.

We are in the early stages of an RDT&E program to modify an existing airframe as an interim scout helicopter. This program, the Army Helicopter Improvement Program, proposes to select from among current inventory airframes, the most likely candidate for modification into a scout helicopter with improved high-density altitude, hot day performance. It will have a Mast Mounted Sight (MMS) incorporating a laser designator, and FLIR capability for night and adverse weather. This improved scout helicopter is urgently needed to fully exploit the capabilities of the modernized COBRA and AAH. It will also be a tremendous combat multiplier in that it can laser designate targets for COPPERHEAD and other precision guided munitions. We ask that you support this program to provide a near term scout helicopter for our forces.

AHIP: Army Helicopter Improvement Program

The HELLFIRE missile, described earlier as the main weapon of the AAH, warrants some elaboration.

AAH with HELLFIRE

HELLFIRE missile

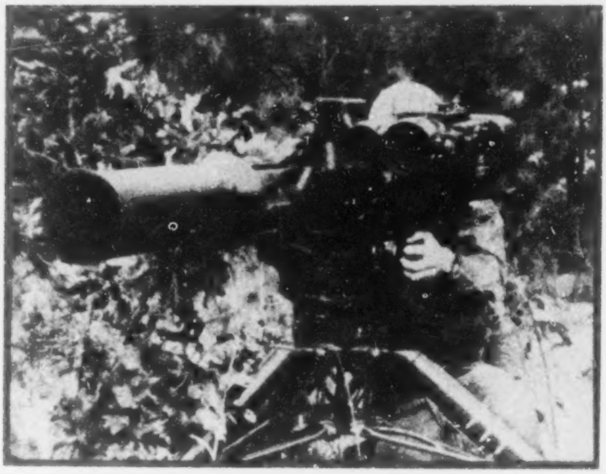
It is a laser guided missile capable of employment both in a direct and indirect fire mode. Mounted on our AAH, the HELLFIRE missile is faster, has longer range, and greater killing power than the TOW. Targets can be laser designated for it by its own AAH carrier, another AAH or scout helicopter, or by a ground laser designator in the hands of armor, infantry, and artillery elements. This flexibility will keep the enemy guessing and limit his ability to counter the missile. The HELLFIRE that will initially be fielded does require that the designator be exposed long enough to "paint" the target with laser energy. We are in the process of developing a true fire-and-forget seeker for the HELLFIRE, which will allow the AAH to take cover immediately after firing. The HELLFIRE's contribution to our combat resources makes its fielding a top priority among force modernization efforts for which we are requesting funds.

Improving the TOW missile

The TOW (Tube-launched, Optically tracked, Wire-guided) anti-tank missile has been the infantry's most potent anti-tank missile since it was first fielded in the late 60's. TOW is crew portable and can be mounted on a variety of vehicles. When its performance against the Soviet tank threat became marginal we began the TOW improvement program to preserve the Army's large investment--over 275,000 TOWs have been produced for the US and its allies. The first upgrade will be a new five-inch diameter warhead of improved design that will give the weapon a greater armor-piercing capability. In the second phase of the program a more lethal 6-inch warhead will be developed; changes will also be made to the missile guidance system. The improved 5-inch warhead can be fitted on all existing TOW missiles and is compatible with all TOW system platforms including helicopters and tracked vehicles. FY 82 funds will be used to complete R&D, to procure new missiles, and to retrofit current missiles to the improved configuration. Modification kits are also being procured for the entire fleet of Improved TOW Vehicles.

TOW: hydra-headed weapon

The increasing number of launch platforms for TOW (ground launcher, FVS, ITV, Cobra) gives us enhanced anti-tank capability, and also makes our own tanks a less prime target.



TOW

Improved TOW Vehicle

The Improved TOW Vehicle, or ITV, combines two existing weapon systems: The TOW missile and modified M113 armored personnel carrier. The system can fire 2 TOW missiles from its hammerhead launcher while the crew can fire and reload under armor protection. In addition, the elevated launcher enables the crew to fire while the vehicle itself is hidden by a gulley, vegetation, or other terrain feature.

ITV

Troop acceptance of the ITV in Europe has been excellent. The Commander in Chief, U.S. Army Europe has made the decision to equip theatre armored cavalry units with the ITV until Cavalry Fighting Vehicles are available, at which time the ITVs will be reassigned to lower priority claimants.

DRAGON replacement

In the medium antitank guided missile area we are pursuing development of a new generation system to replace Dragon in the late 1980's. There are a number of new technologies that offer unique capabilities for a manportable system.

VIPER: last ditch weapons

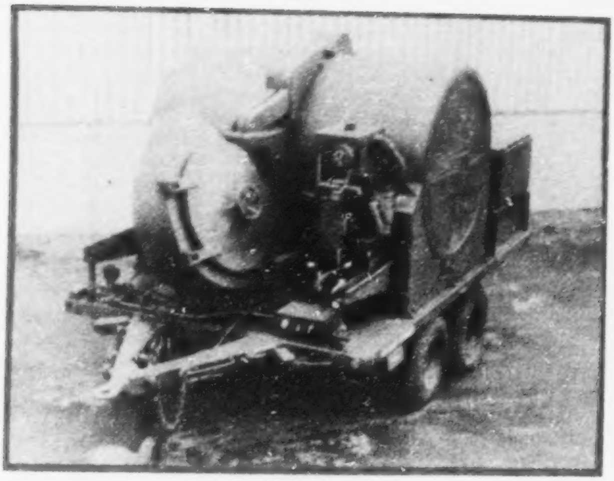
VIPER is a short range, lightweight antitank rocket which replaces the LAW. VIPER provides a higher hit probability, greater lethality, longer effective range, and increased reliability. VIPER is used for "last ditch" defensive situations against enemy armor.

VIPER

Wherever the mobility of tanks and other vehicles is restricted, VIPER can be used with devastating results. It will not only destroy tanks but has limited capability against secondary targets such as wheeled and tracked vehicles, bunkers, field fortifications, crew served weapons, and targets in built up areas. VIPER can be issued to virtually every man on an as needed basis. The tactical round is packaged and sealed in an expendable launcher that also serves as a tactical container. Once VIPER is fired, the launch tube is simply discarded. FY 82 budget request will fund the second year procurement of VIPER.

Use of minefields

Minefields can be used to disrupt and delay enemy tank assaults as well as deny his planned avenues of approach. While mines do not normally destroy more than the first few spearheading tanks, they do force the tank commander to make decisions that take a toll in time or in tanks. If he decides to halt and clear a path through the minefield, he must compress his tank formation into single files, jeopardizing them to concentrated fires of our anti-tank weapons. If he runs the tanks through the minefield in Kamikazi fashion--depending on the later waves of tanks to make it through--he pays a heavy price in tanks. Maneuvering around the minefield costs him time, and he may have to cross disadvantageous terrain or a preselected killing zone.



GEMSS

Emplacing mines quickly with GEMSS

To counter a blitzkrieg tank assault it is obvious that minefields must be emplaced quickly. In bygone days a minefield had to be laboriously and carefully planted, one by one. We will be able to lay large prepared mine-fields in friendly territory when the Ground-Emplaced Mine Scattering System (GEMSS) is fielded in FY 83. GEMSS, a trailer-mounted system that holds 800 mines, flings the mines out to the side at intervals of either 30 or 60 meters in whatever density is desired. With the previous mines and dispensers, it would take 50 hours to lay a 2500 meter anti-tank minefield and require 46 five-ton truckloads of mines. GEMSS can lay a more effective minefield in 3 hours and needs only 2 1/2 truckloads of mines to do it. The GEMSS mines weigh 4 pounds apiece and are as capable of destroying a tank as the old 30 pound blast mines that are still in the inventory.

Digging in to fight

Another key element in the active defense is the positioning of our armored vehicles in hull defilade which, in conjunction with the use of obstacles such as minefields and tank ditches, greatly increases the combat effectiveness of our forces. In a properly prepared hull defilade position, only the turret of the tank or fighting vehicle is exposed. The limited profile reduces the probability of identification as a target by an attacking enemy ground force and compounds the difficulty of an enemy force to engage and kill a defending system.

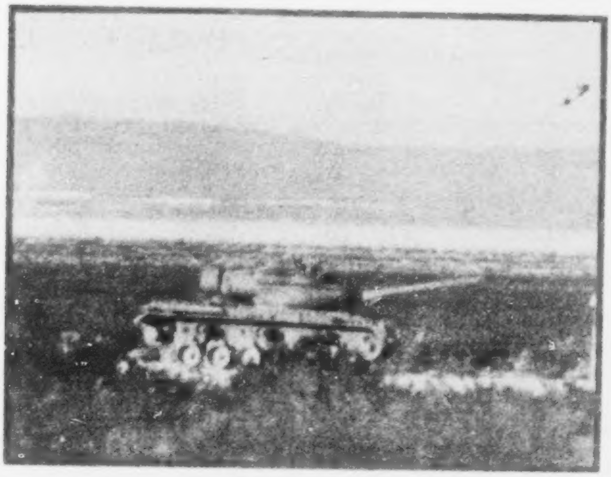
Armored Combat Earthmover

The Army needs the capability to dig hull defilade fighting positions for its tanks and fighting vehicles when and where required by the maneuver force in the fast moving environment of the active defense. The M-9, Armored Combat Earthmover, is uniquely designed to fill this need; it has the speed and mobility to keep pace with the combined arms force, the armor protection to survive on the modern battlefield, and the ability to dig in tanks and fighting vehicles rapidly. The initial procurement of the M-9 is planned with FY 82 funding.

The slow down of a tank attack must be followed up with highly accurate antitank fire. Field artillery units have never been able to provide this kind of fire

Copperhead provides revolutionary tank killing capability

support against moving targets until now. The WW II artillerymen faced the statistical probability of wearing out his gun tube before hitting a moving tank. The addition of Copperhead, a cannon-launched, laser-guided 155mm howitzer projectile into field artillery units will change the odds dramatically. Copperhead has a high single shot kill capability against armored targets and is so accurate it can hit moving tanks routinely at 16 kilometer range.



Copperhead

Copperhead can be fired from any 155mm howitzer. It will not replace conventional artillery area fires, but rather add the ability to engage hard point targets. It is thus a force-multiplier that significantly improves the Army's antitank capability within the existing force structure.

The Copperhead projectile acquires and homes on the laser energy reflected from a target illuminated or "painted" by a laser designator. The Ground Laser Locator Designator (GLLD) will provide the near-term designator capability but helicopters and Remotely Piloted Vehicles (RPVs) with on-board laser-designators will provide a range of options in the future. The operational methods for acquiring and lasing targets will be summarized in our fire support section.

Copperhead improvements

A great deal of work has been done to improve Copperhead's reliability in obscured environments. These improvements will be incorporated during the first production run in 1981. These reliability fixes, and a dramatic breakthrough in Copperhead's seeker circuitry, will provide significant improvements, particularly in smoke and dust battlefield conditions. RDT&E funding will permit continuation of the warhead improvement program and investigation into range enhancement potential.

FIRE SUPPORT

Soviet use of mass

Soviet doctrine emphasizes the use of mass, and echelonment in depth. Warsaw Pact forces believe that they can afford to attack with successive waves of forces, accepting massive losses of men and materiel as an acceptable price to pay for victory. We therefore are highly motivated to attack him deep in order to disrupt his formations and reduce his momentum.

We must be able to strike early and strike deep with great accuracy and massive firepower. We must also be capable of attacking his units up to the forward edge of our troop positions with concentrated, accurate, and readily available firepower.

The Soviet's early use of their own artillery will make this task even more difficult. Their doctrine stresses the use of concentrated artillery fire in coordination with blitzkrieg maneuver of troops. The Soviets greatly outnumber us in artillery and are capable of pounding our positions with massive amounts of indirect fires. Through effective counterfire, our own field artillery must be able to neutralize their indirect fire systems.

Need for improved firepower

Our current field artillery capability simply does not measure up very well against the requirements outlined above. Until we get more of our new systems in the field, we will remain outnumbered, outgunned, and outranged by the Soviets. Fortunately, our new systems provide across-the-board improvements, and in many cases add new dimensions to field artillery capability.

Attacking the second echelon with Lance

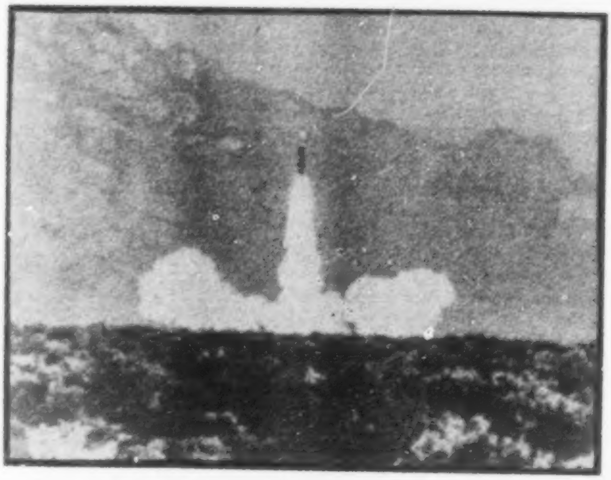
The present Lance missile can be used for an early attack on second-echelon formations. Lance can deliver a warhead with some 1,000 pounds of bomblets in excess of 70 kilometers. Logistic facilities, assembly points, air defense sites and communication centers are prime targets for nonnuclear Lance. Lance also provides the Corps Commander his deepest tactical nuclear capability.

Corps Support Weapon System

A follow-on to the Lance is now being explored as a weapon for the 1990's--the Corps Support Weapon System, CSWS. CSWS is envisioned as having nuclear, conventional (possibly antiarmor) and chemical roles, with the capability of striking far deeper and more precisely than Lance.

Pershing II

The Army's most powerful weapon is the Pershing II, which has twice the range of the existing Pershing 1a and much more accuracy. The Pershing II system employs radar area correlation to achieve its pinpoint accuracy. Radar "pictures" of the target area, in casette form, are inserted in the missile prior to launch. As the re-entry vehicle approaches the general target area it takes its own radar "pictures" of the terrain, comparing them to the original. By making course corrections until the two pictures coincide, the missile can achieve surgical accuracy. This permits the use of a small nuclear warhead that reduces collateral damage to a minimum.



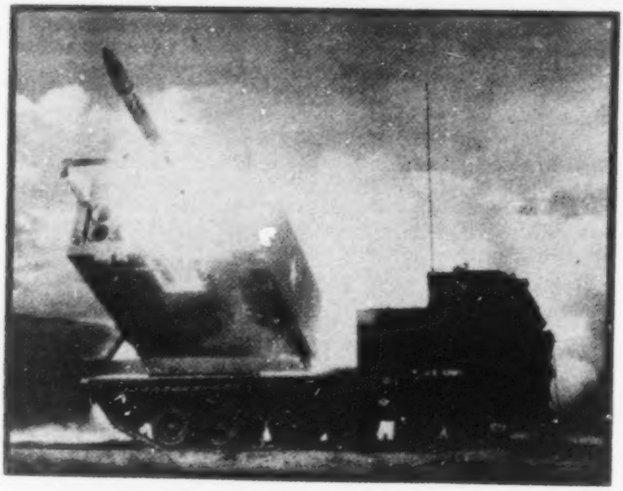
Pershing II

NATO has selected Pershing II and the Ground Launched Cruise Missile as the two ground launched components of the Nuclear Force Modernization program. The Soviets have deployed their SS-20 ballistic missiles, which threaten virtually all installations and cities in western Europe. Recognizing the urgent need for Pershing II, the president granted the program a DX (Brickbat) status making it a program of the highest national priority. Pershing II is in full-scale engineering development and is scheduled to be deployed in the mid-1980's.

Increasing conventional firepower with the MLRS

We must be prepared for any contingency, but our first-response capability must be adequate conventional firepower. As enemy units advance, there may be critical periods when large numbers of targets threaten to overwhelm the capacity of tube artillery.

The new Multiple Launch Rocket System, or MLRS, will be able to deliver massive indirect firepower in short response times. The rocket module of the MLRS consists of two pods, each containing six rockets; the rockets, which contain hundreds of submunitions, can be fired in less than one minute and saturate an area with fragments and explosives. These submunitions are devastating against "soft" air defense sites, artillery positions, and troops in the open at ranges in excess 30 km. Over three 8-inch artillery battalions firing simultaneously would be required to deploy an equivalent number of submunitions as deployed by one launcher load of 12 rockets. The need for a system to suppress the artillery and air defense threat was well illustrated in the 1973 mid-east war. In the first afternoon of battle the Israelis lost about 35 aircraft to anti-aircraft fire. Such air losses dramatically declined after the Israelis employed rocket artillery against enemy air defense systems. Similarly, Israeli tank losses to antitank guided missiles declined dramatically when they "relearned" how to use artillery suppressive fires.



MLRS

MLRS is easy to operate

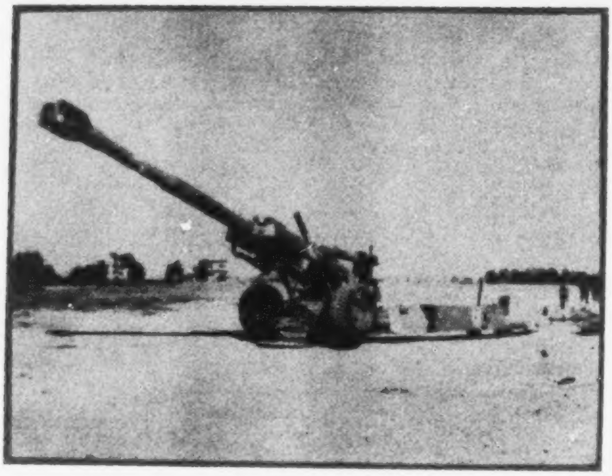
The 3-man crew of the MLRS can stop at a firing site, conduct an entire fire mission and depart, all in the safety of the vehicle cab. An on-board computer unit computes fire commands, sets fuzes, and automatically aims the rockets at the target. The MLRS also has extremely good cross-country mobility and can travel overland at 40 mph.

Terminally Guided Submunitions

The MLRS is being developed by the US in cooperation with Germany, France, and the United Kingdom. In conjunction with these allies, we also plan to pursue the development of a Terminal Guidance Warhead, TGW, this warhead enables the MLRS to attack hard point targets deep in the enemy's first echelon area in excess of 30 kilometers from the launcher. The concept calls for a rocket to fly to approximately 1-2 kilometers above the kill zone, where the warhead will discharge four to six terminally guided submunitions--TGSMs. Utilizing advanced sensor-seeker technology, six TGSMs can search an area and then hit armor targets with precision. France, Germany, and the United Kingdom are sharing the costs and risks associated with the concept definition phase. This consortium could very well establish a model for future international developmental programs.

Cannon artillery

The M198, 155mm towed Howitzer, which is now being fielded, is our newest howitzer and is capable of firing 30 kilometers using a rocket assisted projectile. It provides major increases in range and reliability over its predecessor howitzers and may be parachute delivered or carried by a variety of cargo aircraft and the CH-47 Helicopter. The M198, like our other Howitzers, can fire scatterable mines, nuclear rounds, ICMs, conventional high explosives, and Copperhead. It will be a major improvement to firepower in the light part of our force. The mechanized and armored portion of our force structure have the M109 self-propelled 155mm howitzer and the M110 8-inch self-propelled howitzer. Both of these weapons date back to the 60's but have been improved over the intervening years.



M198

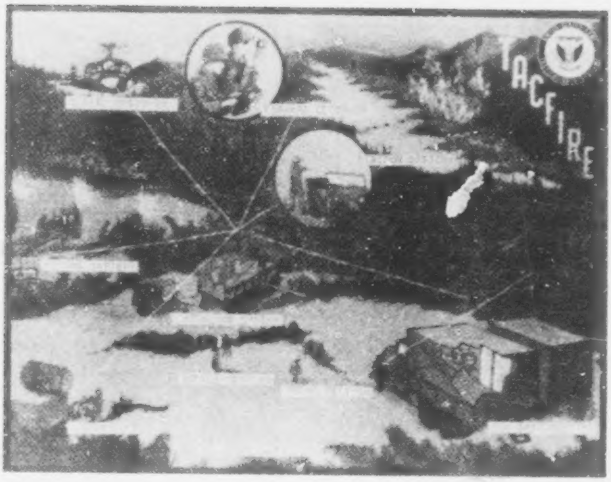
There are no procurement funds in the FY 82 request for howitzers of any type. Our M109A2 production line is staying active through foreign military sales, however, our M110A2 line will go cold this calendar year. Unless funding is received in 1983 to buy additional M198 howitzers, that production line will go cold in May of 1984. On balance, having no warm base for artillery weapons is a serious mobilization concern.

Improved fire direction with TACFIRE

The awesome task of the field artillery on tomorrow's battlefield will be to judiciously manage the kind of enhanced firepower capability we have been describing. Our fire direction system, TACFIRE, gives field artillery an automatic data processing system that enables efficient and rapid-reacting artillery fire. Testing has shown TACFIRE to be approximately twice as fast as the current manual system at fire mission intensities expected on the next battlefield, and more than ten times as effective when considering munition selection, volume of fire, and accuracy. As more target acquisition systems enter the battlefield, TACFIRE's automatic processing will be even more important.

Follow-on to TACFIRE

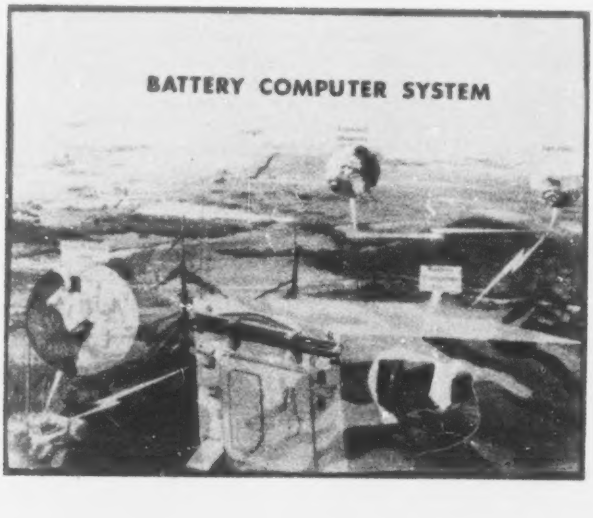
In order to keep our command and control effective and efficient on the future battlefield, we have already begun the Advanced Field Artillery Tactical Data System. This system will use the proven concepts for TACFIRE and take advantage of TACFIRE's modular design to develop, in an evolutionary manner, a follow on system to TACFIRE.



TACFIRE

Battery Computer System

The Battery Computer System (BCS) is a small, vehicular mounted gunnery related system which will replace the obsolete Field Artillery Digital Automatic Computer (FADAC) in artillery batteries. The BCS will perform ballistic computations for individual weapons, do target predictions, and interface with other artillery fire direction systems. The Army intends to acquire BCS for both active and reserve force requirements because of the urgent need for fire direction modernization. The BCS also performs the functions of the TACFIRE Battery Display Unit (BDU) deleting the requirement for procuring additional BDUs. FY 82 funds complete the buy required to outfit the remainder of the active force.



BCS

Acquiring Meteorological Data

It will be the job of our new Meteorological Data System, MDS, to insure that artillery fires are adjusted to account for changing atmospheric conditions across a broad front. Greatly increased ranges of artillery projectiles will cause them to be exposed to atmospheric effects for increased periods of time. Reliable data are also required on how weather affects electronic warfare and battlefield obscurants employed by the enemy. During the days preceding the Normandy invasion, General Eisenhower started every morning with a report from his meteorological experts. In a "dirty battlefield" environment where anything from a severe storm to chemical, nuclear or biological conditions can prevail, we must have timely meteorological data.

The MDS will replace the current 30 year old system whose deficiencies are too numerous to catalogue here. It uses manual data reduction, requires a 14-man section, does not interface with TACFIRE, and cannot be employed on the forward edge of the battlefield. Because it interferes with their satellite control frequencies, the Federal Republic of Germany has mandated that the Army terminate its use in Europe. The MDS will fill our needs and provide reliable and fresh (hourly) MET data. Its ability to collect data while "on-the-move" adds a new dimension to tactical MET support.

Ammunition

Ammunition has been justly called the life blood of the artillery. In fact, it is essential to all elements of the combined arms force. Our ammunition request provides for: Improvement of near term readiness; new munitions associated with modernization of Army forces, annual training needs, and a modest increase to sustainability. We also seek to modernize some existing World War II facilities, which are deteriorating and provide the production capability for new ammunition items.

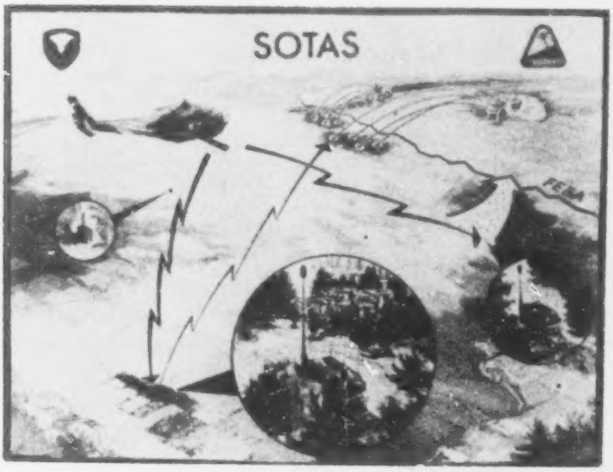
The field artillery has been alotted the largest portion of our resources for ammunition procurement. Major items in this category are 8-inch and 155mm Improved Conventional Munitions; 155mm Copperhead projectiles; 155mm Area Denial Munitions and Remote Antiarmor mine system projectiles. Other significant categories include tank gun, small arms and mortar ammunition.

The munitions research and development programs cover all types of conventional munitions from exploratory development through engineering development. Major areas include technical base programs for large caliber munitions development and ballistics technology work applicable to all systems; development of modernized ammunition for the 105mm tank fleet and development of the German 120mm gun system for introduction on the Abrams tank in the mid 80's; field artillery munitions such as the Sense and Destroy Armor (SADARM) projectile delivered, top attack, antiarmor submunition, and numerous smaller projects for development of fuzes and propellants; and research and development of mine and countermine systems with work on the Modular Pack Mine System (MOPMS) and the Off Route Antitank Mine System (ORATMS) that will significantly enhance our mine and barrier capabilities.

Weapon systems without targets are likely to become targets themselves ... We move now to Target Acquisition.

SURVEILLANCE, TARGET ACQUISITION, AND NIGHT OBSERVATION (STANO)

Determining the exact location of the enemy's combat power is important on any battlefield but it is absolutely essential where the enemy is superior in manpower and hardware. Once we receive an early warning from reconnaissance aircraft, we will begin monitoring the enemy's movements with the Standoff Target Acquisition System -- SOTAS.



SOTAS

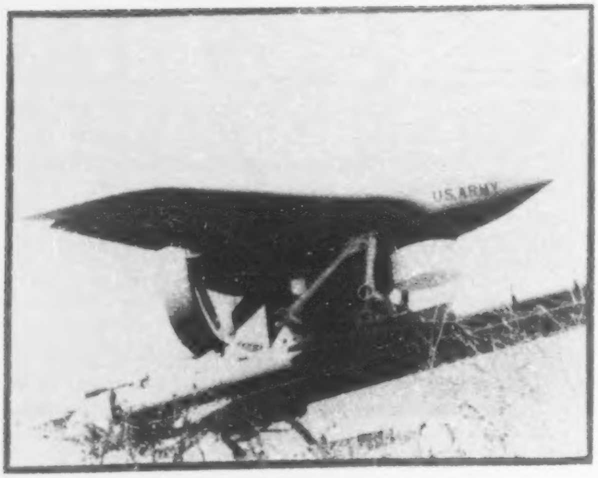
SOTAS: sees deep into enemy territory

The SOTAS, which employs a moving target indicator radar mounted on a Black Hawk helicopter, flies well in back of friendly lines but can "see" deep into enemy territory. SOTAS will be able to display the enemy's movement in ground stations located at division, brigade, and division artillery headquarters. Moving tanks, trucks, helicopters, etc., register as little dots on an electronic map. This real time display also shows the targets' speed, and direction of movement. Information provided by SOTAS enables the commander to position his forces properly and begin timely firing with his long range artillery weapons.

Remotely Piloted Vehicle

SOTAS will also be used to support the Remotely Piloted Vehicle (RPV). The RPV is a relatively small aircraft equipped with a TV that is monitored by personnel in a van near the launch site. With long-range target location data provided by SOTAS, the RPV can fly to selected target areas. Once there, the RPV can be used to locate targets, adjust artillery fire, or laser designate targets for destruction. The controller need only place the cross hairs on a target visible on his screen and flip a switch to command the RPV to turn its laser on. Laser-seeking weapons such as Copperhead can be fired into the general target area and then home in on high value targets that have been laised for them by the RPV.

Reconnaissance will be another high-priority function of the RPV. If called for, the RPV can fly above a key enemy zone in order to gain required data. The air defense strength of the enemy is likely to make manned reconnaissance

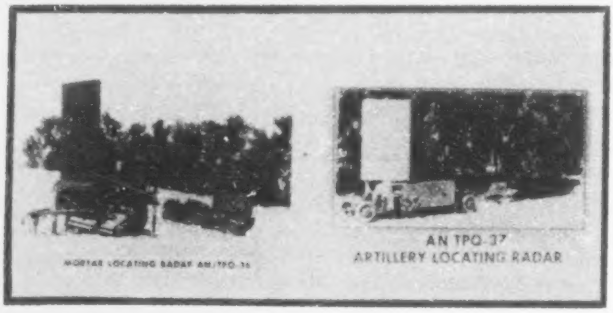


RPV

extremely risky. Small RPVs, which are incredibly difficult to track and hit, will allow us to fly reconnaissance missions without risking pilots or valuable aircraft.

Advanced radars

The Soviets massive artillery capability will also threaten our combat operations. To meet this threat, each of our divisions will be equipped with two counterbattery radars, AN/TPQ-37, and three countermortar radars, AN/TPQ-36. They will enable us to silence enemy mortar, artillery, and rocket fires before they can be effectively adjusted. These radars provide rapid first-round location of artillery pieces by backplotting the trajectories of projectiles. Through interface with the TACFIRE System, radar location data can be sent to our guns before the first enemy round hits. Without an automated fire direction system like TACFIRE, use of these advanced radars would be like restricting a Ferrari to a 25 mph zone. These radars are capable of locating targets and providing results to the TACFIRE computer.



MORTAR LOCATING RADAR AN/TPQ-36

AN TPQ-37
ARTILLERY LOCATING RADAR

GLLD

Forward Observer users GLLD to designate for COPPERHEAD

As the enemy nears our front lines, the Ground Laser Locator Designator (GLLD) can be used to "spotlight" targets for laser-homing munitions such as COPPERHEAD and HELLFIRE. In employing the GLLD, the forward observer provides target coordinates and other data to the fire direction center. After he has received word that the COPPERHEAD round is on the way, he switches on the laser several seconds before the round is due to strike. COPPERHEAD, as it nears the area of the target, locates the laser spot on the target and flies into it.

Fire Support Team Vehicle

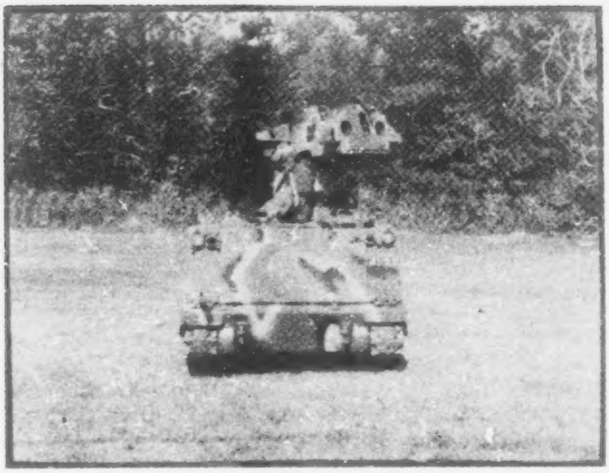
The present Fire Support Team (FIST) must dismount from their carrier to use GLLD on a ground mounted tripod. The Fire Support Team Vehicle, FISTV, will give the FIST team needed armor protection, mobility, and communications to operate with fast moving armor, mechanized infantry, and cavalry units. The FISTV is equipped with a GLLD, and a north-seeking gyro that provides the direction needed for accurate artillery fire requests.

The FISTV is very similar in appearance to the Improved TOW Vehicle and can operate in hull defilade with only the hammerhead of the vehicle exposed if terrain permits. FISTV completes the link with new technology munitions such as COPPERHEAD to produce fast, efficient, first-round kill capability on moving armor vehicles or other point targets.

Night fighting

Nightfall will no longer bring down even a partial curtain on battle activities. Because of advanced night vision devices, night will simply mean a slightly altered environment to soldiers in a future war. Night battles were conducted in the 1973 mideast war in total darkness. A noncombatant would have seen only the light of muzzle flashes and burning vehicles, yet both sides were exchanging accurate fire.

Until recently, devices to assist the soldier in "seeing" in the dark have had serious drawbacks. The use of active infrared night-vision devices dates back to before the Korean war. These devices "actively"



FISTV

emitted infrared light by which targets could be seen by looking through special lenses. However, if the enemy was also wearing special lenses, he could pinpoint the user as surely as if he had turned on a flashlight.

One of our present generation night vision devices is passive, in that it does not radiate any form of energy. It simply amplifies natural light from stars and natural ground phosphorescence. Such "Image intensification" devices were used successfully in Vietnam.

Thermal imaging

The latest version of passive night vision devices employs thermal imaging. By sensing the ranging temperatures between objects and their surroundings these devices can differentiate or "see" tanks, trees, people and anything else that has a temperature signature. These devices are sensitive enough to see through haze or fog; more importantly, they can see through the smoke that the Soviet units rely on to mask their armor movements. This is a technology area in which we clearly lead the Soviets.

The Surveillance, Target Acquisition, and Night Observation -- STANO -- Systems lend new force to the military adage, what can be seen can be hit. By eliminating the element of surprise and freedom to mass, these systems rob the enemy of two of his most effective tactics. They are likewise critical in mounting a counter attack against superior manpower and hardware.

AIR DEFENSE

The Army has a well thought out plan for modernizing its air defense systems to cope with the increasing Soviet air threat. Without adequate air defense coverage, all ground combat elements are exposed to annihilation by early and massive air strikes. Troops and vehicles, supply lines, command centers, airfields, bridges, and all other high value targets are vulnerable.

Soviet air power threat

The Army can expect first-rate support from the Air Force; however, Warsaw Pact forces have over 3,000 combat aircraft in the Central European area, including bombers, fighters, and helicopters. Some of these, such as the MIG-23, are designed specifically for ground attack. Another, newer threat is posed by attack helicopters capable of launching tank-killing missiles.

In order to protect our combat assets on the ground we must have a fully integrated Air Force/Army air defense umbrella. The Army will not be pulling its own weight in terms of air defense readiness until we complete the modernization of our air defense system.

Shortfall in air defense coverage

Our modernization efforts in FY 82 have been slowed substantially. Our request is for procurement of lesser quantities of Patriot, DIVADS and STINGER than planned and modification of a reduced number of I-HAWK and Chapparral. It provides funds to complete the procurement of only one battalion of Roland. Failure to adequately fund the modern family of Army air defense systems creates severe shortfalls in air defense coverage for maneuver forces and key installations.

Front line vulnerability

To cite just one example, units deployed in the main battle area will be extremely vulnerable to anti-tank guided missile launching aircraft. This vulnerable area includes modernized combat units we will be fielding such as the Abrams equipped tank force operating on the forward edge of the battlefield. The Division Air Defense, DIVAD, gun which is designed to defeat such threats, was initially developed on a highly accelerated schedule to "get the system into the field fast." Other air defense systems (Stinger, Vulcan, Chaparral, etc.) cannot fulfill the task for which DIVAD is designed due to limited range, reaction time, or lack of armor protection. As the Congress is aware, DIVAD Gun procurement was delayed significantly because of affordability considerations, thus extending the period in which our front-line forces will be without adequate air defense coverage.

Patriot: key deterrent to Warsaw Pact attack

The centerpiece of the European theater air defense family will be Patriot. It is designed to defeat saturation raids by large numbers of sophisticated aircraft employing electronic countermeasures. Intense electronic jamming and limited fire power capabilities now threaten the usefulness of Nike Hercules and Hawk, the systems Patiot will eventually replace.

Patriot can simultaneously attack and destroy several enemy aircraft while tracking scores more. One of the main shortcomings of Hercules, which has been in the force since 1958, is that one battery can engage only one aircraft at a time. The operator has to wait until the missile goes all the way out to the target and detonates before firing another missile.

Track-via-missile guidance

Patriot employs a new guidance concept called Track-Via-Missile. As the missile reaches the area of enemy aircraft it informs the radar where it is in relation to the target. A computer then makes calculations and directs the missile on a path that insures a kill.

Patriot

Each of Patriot's launching stations contains four ready-to-fire missiles. The missiles are sealed in a canister that serves as both a shipping container and a launch tube. They require very little maintenance. The Patriot system employs up to eight truck-mounted launchers that can be widely dispersed. Communication with the Engagement Control Station is made via secure data link.

Targets prioritized for destruction

Enemy targets can be tracked and prioritized for destruction through the interaction of Patriot's radar and computer. The radar can guide several missiles at the same time, updating priorities as threat aircraft simultaneously disappear from the screen and sky. Operating modes vary from manual mode to fully automatic mode. The system's two operators always retain full override capability over computer decisions.

We consider the Patriot system to be a key deterrent to Warsaw Pact attack. It is our only High to Medium Altitude system capable of operating in the electronic countermeasures environment expected in the mid-eighties and beyond. Patriot is now in limited production. NATO is currently working with the US Army on acquiring it for their own forces.

I-HAWK: mainstay through the 80's

The mainstay of the Army's low to medium altitude air defense has been the I-HAWK missile system. I-HAWK will eventually be replaced by PATRIOT after it replaces NIKE-HERCULES. Ongoing and planned product improvements will significantly upgrade I-HAWK system performance to meet the projected threat of the 80's. Nineteen foreign countries have bought the system with procurement interest expressed by several others. Part of this world-wide acceptance can be attributed to HAWK's showing in the 1973 Mid-East war, where, in its basic configuration, it downed more than 20 MIGS and other aircraft.

I-HAWK

Chaparral is the Army's short range defense missile system. It is effective against all types of aircraft at low altitudes; however, Chaparral has several shortcomings that we are correcting to keep it effective into the 1980's.

Chaparral

Chaparral improvements

We are procuring Forward Looking Infared modules to allow the operator to see targets at night and in poor weather conditions. Chaparral is visually directed. The FLIR presents to the gunner a black and white TV-like presentation based on infrared emissions from the target. Since the Chaparral missile emits a smoketrail that reveals the exact location of its launching pad, we are procuring smokeless rocket motors. An identification Friend or FOE (IFF) device is being installed on each fire unit to assist the gunner in identifying friendly aircraft. We are also continuing RDTE work on a Passive Optical Seeker Technique (POST) guidance system to keep Chaparral effective against targets using countermeasures.

Roland

The U.S. Roland missile system is the only major weapon system developed by the Europeans and adopted for use by the United States. More importantly, it is the Army's only all-weather short range air defense missile system. Roland, which is mounted entirely on a tracked carrier, has the capability of destroying up to ten aircraft without reloading. We need this kind of firepower to meet the growing all-weather, low-altitude threat from high performance aircraft. It is also significantly resistant to electronic countermeasures. If a mission should require it, Roland can be removed from its tracked chassis for rapid-reaction airlift and independently sited where needed. We had originally planned to procure four battalion sets of equipment to provide our European forces with the minimum essential air defense of its rear area assets. However, due to constrained resources, we are currently procuring one battalion of ROLAND.

Roland

Division Air Defense Gun

We previously mentioned the urgent need to field the DIVAD gun. The present 20mm Vulcan System cannot provide adequate protection to rapidly moving armored and mechanized forces. With its longer range, larger caliber gun, armor protection, and full-tracked mobility, DIVAD will be able to defeat both low-flying fixed wing aircraft and helicopters. Attack helicopters--firing antitank guided missiles--pose a threat to our forward maneuver forces which is growing quantitatively and qualitatively every year. The DIVAD gun is the only ground air defense system specifically designed to counter this threat. Its advanced radars detect aircraft and helicopters and automatically provide the location data for aiming the gun to the onboard digital computer, providing the rapid reaction capability necessary to counter the threat. The DIVAD system fires high-explosive, point detonating or proximity fuzed ammunition. Armor piercing ammunition can also be fired, in self-defense, to destroy any lightly armored combat vehicles.

DIVISION AIR DEFENSE (DIVAD)
GUN CANDIDATES
FORD AEROSPACE
TWIN 40MM
L70 BOFORS
GENERAL DYNAMICS
TWIN 35MM
KDA OERLIKON

The FY 82 DIVAD program is scheduled to complete the development of test and training equipment and to finalize the logistics support data. Final testing, to validate the total system (including supportability) will be completed prior to fielding. The procurement funding will be used to procure the first 12 systems and associated test and training equipment.

Stinger

Stinger replaces Redeye

Stinger, a shoulder fired anti-aircraft missile, will ensure that the smallest of combat units is never completely without air defense coverage. The missile homes on the heat emitted by jet or propellor driven fixed-wing aircraft or helicopter. Stinger is faster and more lethal than the Redeye system which it replaces; more importantly, it can home on enemy aircraft from any angle and can handle modern jet aircraft at their expected attack speeds. Redeye cannot. Redeye was sometimes referred to by the troops as a revenge weapon since it is tail chase only. The gunner sometimes had to wait until an enemy aircraft had strafed him and passed overhead before acquiring and firing. Stinger is in production and will be fully operational in the near future.

The importance of getting our new air defense systems to the field cannot be overemphasized. They will provide great improvements in capability as well as significantly reducing our defense manpower requirements.

COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE

The success of our combined arms team will depend heavily on a first rate communications network. Every asset of our Army must be brought into play based on reliable, up-to-the-minute battlefield information.

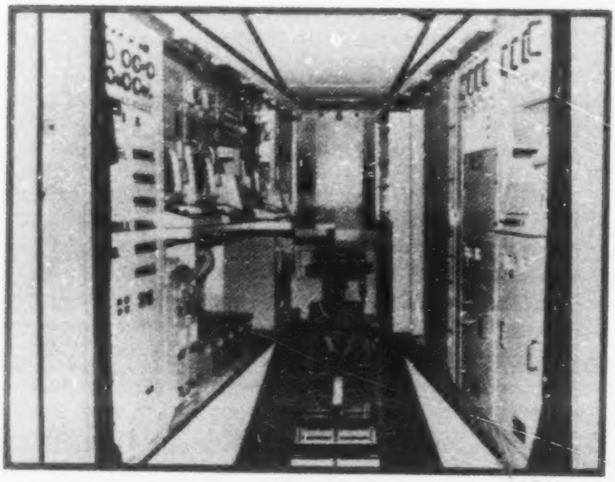
Keeping pace with communications

Communications is a field in which the US possesses technological know-how and equipment envied and pursued by all nations. Although our own Army did not keep pace with technology in the 70's, the 80's will be marked by sweeping improvements. We will be moving from an era of grease pencils and PFC-operated plug-in switchboards to an era where the Army's entire communications network will be modernized.

Communicating on a chaotic battlefield

A commander on a future battlefield will need to know the status of an enemy whose every move will be cloaked in deception. If he is to make correct tactical decisions, he must know as many of the battlefield variables as possible, and know them quickly and accurately. This communications challenge must be achieved under stressful conditions, made even more chaotic by the use of enemy communications jammers of every sort. We must preserve the integrity of our own communications network, while at the same making every effort to disrupt and destroy the enemy's communication systems.

The first system we would like to cover is the Joint Tactical Communications (TRI-TAC) program, which



TRI-TAC

TRI-TAC is a Joint Service and DoD Agency program to develop and field future tactical multichannel switched communications. The broad goals of the TRI-TAC programs are to achieve interoperability between Army and other DoD telecommunications systems, provide new equipment which reflects the most recent technology, and eliminate duplication among and enhance interoperability with NATO systems.

The TRI-TAC family of equipment consists of digital telephone and message switches, secure and non-secure phones, subscriber terminals, multichannel radios, tactical facsimile equipment, and many other associated items. This equipment is urgently needed to replace the non-secure, obsolete, manpower intensive, and predominantly manual communications equipment currently in the field. TRI-TAC equipment is designed to provide for an evolutionary transition from analog communications to modern and flexible digital communications. This will satisfy an urgent user need since there is no digital switching capability in the Army's current tactical inventory of equipment. Equally important, TRI-TAC equipment is designed to survive in a combat environment. It incorporates both nuclear hardening and jam resistance techniques.

Circuit and message switches

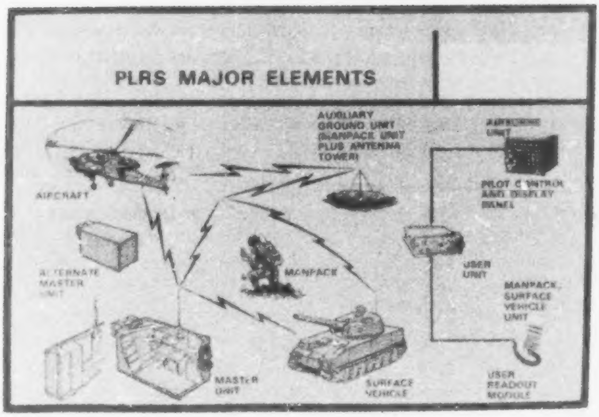
The Army was charged with the responsibility to develop the TRI-TAC switches. We are now procuring the circuit and message switches which will be the heart of the multichannel network connecting telephones, message traffic, and data users in both secure and nonsecure modes.

Tactical radios

The Army does not now have a tactical radio system capable of operating in the electronic counter measure environment expected. The Single Channel Ground and Airborne Radio System, SINCGARS, will give the soldier a jam-resistant, securable radio system capable of operating in all combat environments. By using a number of add on devices or "building blocks," the user can incrementally increase his level of communication protection. For example, if we feel the enemy is intercepting our communications, the soldier can upgrade the system by adding a secure capability. If, later on, the enemy attempts to disrupt our communications through electronic countermeasures, we can then have the capability to add a jam-resistant device. SINCGARS is a tremendously innovative communications system that promises improvement over our current assets.

In FY 82, the Army will continue with advanced development and initiate testing of the SINCGARS family of equipment. Many of the tasks normally associated with engineering development are being accomplished in advanced development to preserve the option of accelerating the program, skipping full scale engineering development if the program is successful enough to do so. This decision will be made in July of 1982.

The pace of battle in future conflict will demand that combat commanders be able to precisly locate them-



PLRS

PLRS

selves and other friendly units. The Position Locating Reporting System (PLRS) allows combat units to navigate the battlefield in all weather conditions and automatically determine the location of other friendly units. It is cryptosecure and highly resistant to jamming.

SIGMA concept

In FY 1981, the deployment of the Tactical Computer System (TCS) and Tactical Computer Terminal (TCT) into the VII European Corps will be completed. The experience gained from the development of this system is assisting us in validating the baseline requirements for the hub of the battlefield automated system that we call SIGMA. SIGMA--which is now in the concept stage--will provide echelons from Corps down through battalion with responsive automated battlefield information. Based on FY 1981 Congressional guidance, the Army has deferred alternative system design development until FY 1982. SIGMA will go a long way towards providing quick answers to the critical questions posed by a commander before making his battlefield decisions. We believe this system merits your support.

Offensive Electronic Warfare

Offensive electronic warfare operations are calculated to disrupt enemy command, control, and communications capabilities. This is an area where the Soviets may be vulnerable because of their rigid hierarchal structure. The Soviet soldier is a product of a repressive society and even more authoritarian military system. He depends almost completely on orders from above to act. This lack of individual resourcefulness may well prove the achilles' heel of the Soviet Army if we can impede the orders which flow from Soviet command headquarters. Every unit-- and even every combat vehicle--is tied by an electronic apron string to its next higher echelon. Another key factor is that a massive invasion of NATO territory would require the highly orchestrated employment of hundreds of thousands of men and vehicles. Disrupting the Soviet's communications network by means of electronic warfare may be a key means of slowing a Warsaw Pact attack, and thereby making them vulnerable to eventual defeat.

Before a commander can employ electronic countermeasures, he must understand the enemy's use of electronic systems. He must see these systems as a target array in which each enemy net or weapon system using electronic emitters has a relative importance. He then assesses each with respect to its contribution to enemy combat power. Programs to enhance a commander's capability to obtain this type of information are extensive and varied. Some items such as the TEAMPACK and TRAILBLAZER are ground-based radar and communications intercept location systems currently being fielded. Others, such as the QUICK LOOK and GUARDRAIL, are airborne signals intercept systems which, though fielded, are being upgraded through product improvements.

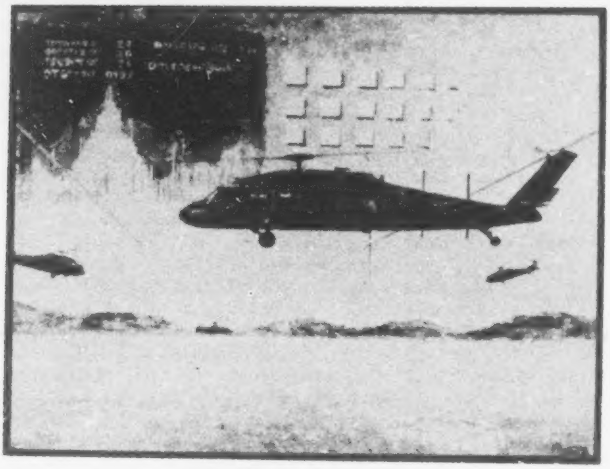
Signals Intelligence/Direction Finding Equipment

Competition for constrained resources has caused the Army to defer the acquisition of some critical ground based Signals Intelligence/Direction Finding Equipment. As we noted earlier, the Soviets are increasingly dependent on electronics to exercise their tactical doctrine. We are not yet capable of exploiting that dependency, especially in the area of the detection and location of combat forces through their use of electronics. Our force modernization plans for equipping the Combat Electronic Warfare Intelligence units are somewhat behind schedule. We are, however, ensuring that we make the most of the resources available and are continuing to exploit the technology which will ultimately lead to a much improved intelligence systems.

Guardrail V

Airborne/Ground Intelligence System: GUARDRAIL V

GUARDRAIL V is a combined airborne ground communication intelligence system with proven ability to provide realtime data on the location of enemy electronic emitters. Improved GUARDRAIL V will be equipped to survive and operate effectively in a high threat, intense jamming environment. The FY 82 budget supports production of the second Improved GUARDRAIL V system.



QUICK FIX

QUICK FIX

QUICK FIX is an airborne offensive communications intercept and jamming system that will deny the enemy the use of his radios during key periods of battle. The QUICK FIX System is capable of intercepting and jamming enemy communications. QUICK FIX is designed to operate against air defense units and maneuver units. QUICK FIX I is currently flown on the EH-1H/X aircraft. Future QUICK FIX II Systems will be mounted in the Black Hawk aircraft. Our R&D requests this year continue to support the YEH-60A and QUICK FIX production prototype development.

QUICK LOOK

QUICK LOOK II is an airborne computer controlled system mounted on a Mohawk aircraft that detects, locates, and identifies enemy radars. It provides tactical field commanders with timely data on enemy missiles, artillery, and anti-aircraft weapons. FY 82 funding will conclude the QUICK LOOK II aircraft conversion and continue product improvement of the mission equipment.

UNITED STATES ARMY

QUICK LOOK

Jamming assets

After the commander has full location data on enemy electronic emitters he can then bring his jamming assets into play.

Ground based jammers

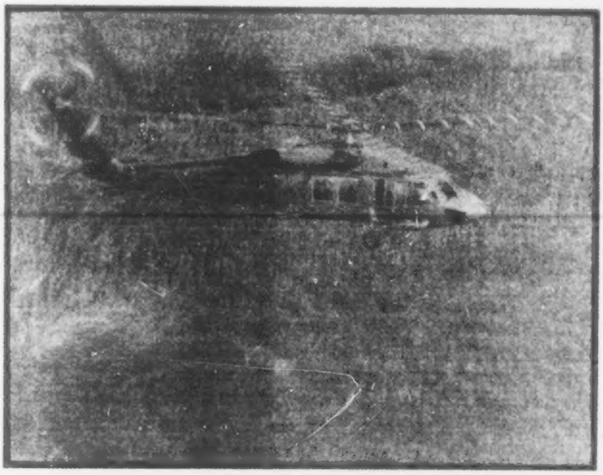
In the area of ground based jammers, within the next few years our combat electronic warfare intelligence (CEWI) units will be equipped with the medium power AN/TLQ-17A and the high power jammer AN/MLQ-34. The Army also has a family of low power expendable jammers in development that are designed for hand/artillery/ or Remotely Piloted Vehicle emplacement. Additionally, the Army is equipping CEWI units with a standard VHF radio electronic countermeasure applique. This device allows us to use our AN/VRC-47 tactical radio to jam the enemy.

MOBILITY SYSTEMS

In most potential conflict areas we can count on having to fight, at least initially, outnumbered and outgunned. Commanders therefore must be able to shift forces rapidly about the battlefield to optimize their overall effectiveness and to avoid head-on encounters with overwhelming forces. Enhanced mobility, both air and ground, provides this tactical advantage which has been a trademark of the American Army.

Black Hawk replaces Huey

The Black Hawk helicopter, which is replacing the UH-1 "Huey" in air assault, air cavalry, and aeromedical evacuation units, will add a big boost to tactical mobility. It can carry troops faster and with greater chances for combat survival than ever before possible. It will also be able to resupply our front lines under extremely rugged conditions with weapons, equipment, ammunition, and other items that feed our combat power.



BLACK HAWK

Keeps the fighting unit together

While the UH-1 is a reliable helicopter, it is power limited, sometimes able to carry only one combat equipped passenger in hot weather and high-altitude conditions. It also proved to be vulnerable to small arms ground fire in Vietnam. The Black Hawk can transport an entire 11-man, fully equipped infantry squad 42 knots faster in extremely rugged conditions. It is also the first utility helicopter that adds mobility to division artillery by virtue of its ability to reposition a 105mm Howitzer, its crew of 6 personnel, and 30 rounds of ammunition in a single lift.

The critical components in the Black Hawk are armored or redundant to enable it to withstand multiple small arms hits. It is invulnerable to the 7.62mm [illegible]r piercing round and tests have demonstrated its abi[illegible] to continue flight for a minimum of 30 minutes after sustaining damage from projectiles as large as the 23mm high explosive incendiary round. The airframe is designed to absorb impact forces by progressively deforming on impact, thereby protecting the crew in a crash.

The Black Hawk is initially being fielded with the 101st Airborne (Air Assault) and the 82nd Airborne Divisions prior to distribution to other high priority units in the continental US and Europe.

Black Hawk used in Operation Bright Star

During Operation Bright Star--a Rapid Deployment Force exercise held in the Egyptian desert--the Black Hawk received high marks from our troops. One helicopter commander noted that he was able to navigate and stay hidden in the desert by finding gullies to move through and high mounds to hide behind. Helicopters could be flown at 45 miles per hour and not leave a "signature" of swirling sand. The ability to shoot and move, rather than hold ground, is a key to success in desert warfare.

Less manpower intensive

The Black Hawk's capability will permit the Army to replace 23 of the older UH-1's with 15 Black Hawk's, thereby reducing the air crews and maintenance personnel required to man our Combat Support Aviation Companies. At a time when skilled manpower is a problem for the Army, this is an important step forward. The Black Hawk is also easier to maintain in the field than any other helicopter in the world.

BLACK HAWK

A research and development effort is also programmed to demonstrate the feasibility of firing the Hellfire missile from the Black Hawk and to develop an external stores support system which will accommodate the Hellfire Missile launchers, external fuel tanks, or the M-56 mine dispenser system. This effort will enhance the mission capabilities of the UH-60 by extending the mission range and providing for self deployability, mine laying, and armed anti-tank capabilities which might prove essential in rapid deployment operations.

Black hawk aircraft procured with FY 82 funds are scheduled for delivery to USAREUR to fill out priority requirements of forward deployed forces.

Extending the life of a part of the Army's aging fleet of UH-1 "Huey" helicopters is an urgent program. The Army will have a requirement for Huey helicopters well into the 1990's to meet our requirements for Active Army and Reserve components. The urgency of the UH-1 modernization program is compounded by reduced procurement rates of Black Hawks and the aging of the UH-1 fleet which is rapidly approaching the end of their 20 year life cycle. The FY 82 budget does provide some procurement funds for limited UH-1 product improvements, but RDTE funds for initiation of design and development work for other needed improvements are deferred.

Chinook's useful life extended

The CH-47 Chinook, currently the Army's only medium-lift helicopter, was designed in the 1950's and fielded in 1962. We intend to extend its useful life beyond the year 2000 by an extensive modernization program. The active Chinook fleet is being substantially upgraded. Modifications are so all-encompassing that the end product is essentially a brand new helicopter--but the cost is significantly less than an all new aircraft would have been.

CH-47D

The Chinook plays a vital role in moving troops, artillery, missiles, downed aircraft and other cargo about the battlefield, either internally or externally in sling loads.

Trucks: backbone of logistical system

While helicopters are essential to the rapid mobility and resupply of the Army, it is our truck fleet which serves as the backbone of our logistical system. It has been said that a soldier cannot be a fighter and a pack animal at one and the same time, anymore than a field piece can serve as a weapon and a supply vehicle combined. Before the allied counter-offensive was launched in WW II, hundreds of thousands of trucks were assembled and made ready to accompany the force. General

Eisenhower singled them out as one of the reasons we won WW II.

Today, large shortages of trucks exist in vital combat support areas. In addition, we will be fielding many new weapon systems such as the PERSHING II, PATRIOT, and the Multiple Launch Rocket System. Trucks are essential if we are to supply fuel, ammunition, and other support necessary to make these modern weapons work.

FY 82 funds are requested for the procurement of 1067 5-ton trucks and 379 10-ton trucks. Funds are also requested to initiate actions toward the procurement of the 1 1/4 ton Commercial Utility Cargo Vehicle (CUCV), and the 1 1/4 ton High Mobility Multipurpose Wheeled Vehicle (HMMWV). The HMMWV comes in 3 different body styles in order to carry out utility, weapons carrier, and ambulance functions. It will serve as a successor to selected 1/4-ton (jeep) and 1 1/4-ton truck (M880 series) and 1/2-ton (mules) and 1 1/4-ton (GAMA GOATS). The Marine Corps and Air Force also plan procurement of the HMMWV.

Trucks and our other logistical equipment give our soldiers the support needed to fight successfully in sustained conflicts. These programs merit your continued support.

PROGRAMWIDE MANAGEMENT AND SUPPORT/RDTE MANAGEMENT

The US effort to maintain a lead in weapons system technology is highly dependent on sustaining an overall stable, high quality R&D management and support capability. Adequate numbers and kinds of professional personnel must be made available along with current state-of-the-art equipment and related logistical services. The synchronization of all the Army's R&D efforts and of individual systems as they progress from basic research through development stages, as well as the availability of adequate support, are key to insuring the Army's success in its R&D programs. The dramatic changes in weapon system technology and sophistication carries with it a demand for a complementary adjustment of management resources and support.

Resources for some activities such as the purchase of laboratory equipment and common service support activities at RDTE-operated installations and headquarters are not related to specifc R&D projects. These resources are requested in the Programwide Activities program. The realignment of DARCOM commodity commands for better R&D management resulted in large growth in R&D Programwide and Headquarters activities. This was a one-time phenomenon and is now leveling out. The Army must now however, update and modernize its laboratory equipment. Most of our laboratory equipment was purchased immediately following WW II. A phased replacement program is mandatory if the Army is to maintain state-of-the-art capability to support an R&D program to meet our future needs.

The FY 1982 budget request supports the manpower and related costs necessary to manage the Army's overall RDTE mission. However, there is still a shortfall in the resources available to modernize laboratory equipment to keep pace with today's technology.

TECHNOLOGY BASE

Keeping pace with technology

The new systems we currently have in development and procurement will give us the opportunity to close both the qualitative and quantitative combat materiel gaps that have developed between the Soviets and us during the last decade. If we are going to be successful in future conflicts, we cannot afford to be technologically outstripped by the Soviets. Consequently, we are going to have to rely heavily on the work performed in our technological base. This will at least give us an ability to keep pace with the unseen developments currently taking place in the hundreds of clandestine scientific installations scattered throughout the Soviet Union.

Our nation possesses advanced technological know-how in many areas that have high potential payoff. For example, in the area of microelectronics, improved production technology of electronic circuitry will yield new capabilities for radar systems, "smart" missiles and projectiles, surveillance, electronic warfare, and communications applications. This is one of several special programs within the technology base that have been identified as Army Areas of Emphasis. These technologies are recognized as timely and ripe for more intensive exploitation by both materiel and combat developers. Other Army areas of emphasis are:

o Millimeter/near-millimeter wave technology: Exploitation of the MMW (Ku band to 70 GHz) and NMMW (100 to 1000 GHz) spectral regions to enable operations in limited visibility environments.

o Gun propulsion technology: Interior ballistics, new projectile propellants, caseless ammunition, gun tube wear, and erosion.

o Fire control technology: Increased precision and speed in acquiring and tracking targets, including on-board data processing and stabilization systems; fire-on-the-move and multiple target capabilities.

o Mobility energy: Engines and fuels for higher efficiency, power, and reliability, and lower cost; reduced dependence on nondomestic fossile fuels.

o C^3I: Command, control, communications, and intelligence technology; modeling of C^3 systems to provide totally compatible systems integration.

o Chemical Warfare/Biological Warfare defense: New methods and materials for protection against and operability in a CW/BW environment.

o Armor/anti-armor technology: Improved armor materials and improved methods of defeating armor, such as kinetic energy penetrators.

The technology base not only enables us to keep pace with the Soviets, but allows us to translate developments gleaned from laboratory experiments into affordable systems. Because of constrained resources, it is essential that our technology be channeled into making systems affordable and maintainable.

Contrary to what some believe, our tech base is not solely geared to generating a continuous stream of technological breakthroughs. Much of our time and effort is spent developing evolutionary advances for the weapons systems already in the field and for those that are just now being fielded. By upgrading our systems to keep pace with the Soviets, we postpone having to develop and field entirely new systems. With this technique we plan to spread our future needs and avoid future "bow-waves".

We cannot slight our tech base if we want to avoid the kind of technology gap that occurred when most of our resources were tied up in Vietnam. We need your continued support to maintain a vigorous and well managed research and technology base.

MEDICAL RESEARCH

Health hazards

The most important and often the most vulnerable component of any weapon system is the soldier operator. The Army's medical R&D program is devoted to keeping our soldiers fit for duty in the face of all of the conditions which threaten their well-being, whether it be occupational hazards, exotic diseases, or the extreme rigors of combat.

Many of our weapons systems have potential health hazards associated with them. Examples are blast overpressure from artillery pieces, armored vehicle noise and vibration, and radiation from laser, microwave, and radar systems. The Surgeon General must find ways to alleviate these environmental problems.

Casualties from diseases have exceeded battle casualties

Deployed personnel are likely to be exposed to exotic diseases in nearly every part of the world. In the Middle East, for example, malaria, diarrheal diseases, and sand fly fever are of major concern. In wartime, casualties resulting from diseases have usually exceeded battle casualties. There is no reason to expect this pattern to differ in the future, except through changes brought about by medical research efforts. There have been some recent breakthroughs of note.

Recent breakthroughs

The Army's discovery of a new drug called mefloquine will prevent malaria and is timely since current drugs are losing their effectiveness against new strains of malaria parasites. Outbreaks of meningitis hit our soldiers a few years ago, in particular during recruitment, mobilization, and training activities. Work on an effective meningitis vaccine has now been finalized by the Army. On the battlefield, care systems must be improved to reduce trauma and speed the patients return to combat. The recent development of naloxame has shown some potential for treating shock.

Another area we are very concerned with is chemical warfare. The chemical warfare (CW) capability of the Warsaw Pact nations poses a great potential for mass casualties. Effective means of providing individual protection against CW agent poisoning are limited and when being used, significantly reduce the efficiency of the soldier.

Along with work on better protective equipment, an expanded effort to develop militarily effective CW prophylaxes and antidotes to protect soldiers from CW poisoning is needed. This will require application of the recent advances in several basic sciences, such as molecular biology, pharmacology, immunochemistry, bioengineering, and medicine. Concurrently, concepts must be developed and systems fielded which are required for patient management, decontamination, resuscitation, and life support.

CHEMICAL WARFARE

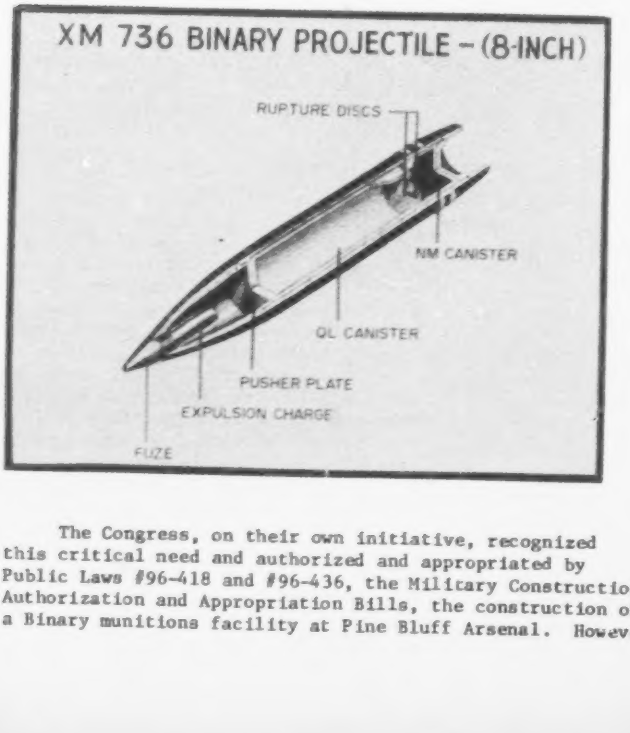
Chemical warfare threat

Chemical warfare may very well be the Army's most vulnerable area in the 1980's. Even though the US is formally committed to the policy of "no first use" of lethal or incapacitating chemical agents by adherence to the Geneva Protocol of 1925, and seeks a complete and verifiable ban of lethal chemical weapons, it has not eliminated the threat and today US forces are facing a chemical threat from an adversary which is the best prepared and trained nation in the world in the use of chemical warfare. Without question, the Soviet Union possesses a formidable offensive capability to wage chemical warfare for an extended period, and their leadership continues to devote significant resources to research, development, and procurement of more advanced chemical weapons and equipment. They also have a large and well-equipped dedicated chemical force, and all units within their armies train extensively for chemical warfare, including the use of live agents in training. It is our desire to deter their use of this capability. However, we and our allies must be realistic and prepare for such an eventuality.

US has aging stockpile of chemical munitions

Given this asymmetry between US and Soviet Chemical warfare capablities, other shifts in the conventional and nuclear balances, and signs of Soviet use of CW directly or through surrogates, we must promptly modernize our own retaliatory capability. Currently, the US has a limited stockpile of chemical munitions for this purpose and all of the munitions in this stockpile are of the unitary design, that is, they contain the actual agent in its final form. These munitions are also aging--some date back to World War II-- and are costly to store, maintain in a usable status, and transport in a safe manner. To obtain and maintain the required credible chemical deterrent capability identified by the Joint Chiefs of Staff, the existing stockpile must be modernized.

XM 736 BINARY PROJECTILE - (8-INCH)



Binary

The Congress, on their own initiative, recognized this critical need and authorized and appropriated by Public Laws #96-418 and #96-436, the Military Construction Authorization and Appropriation Bills, the construction of a Binary munitions facility at Pine Bluff Arsenal. However, the $19 plus million funding for equipping the facility was denied by the Joint Appropriation conferees "without prejudice." Nevertheless, they supported "The need to modernize our production base for these munitions" and stated that they "expect the new administration to give this serious and important matter early consideration and to forward its recommendations for carrying out this project." Funds for procurement of production equipment for the Pine Bluff Arsenal Facility were included in the FY 1982 budget submitted by OSD to OMB but were removed by subsequent executive level review. An FY 81 supplemental request has been submitted to provide equipment for the Pine Bluff Binary Facility, so the Army can be prepared to begin the long overdue modernization of the deterrent/retaliatory stockpile.

At the same time, we must continue the procurement of additional chemical protective equipment in FY 82 to improve the ability of our forces to survive an initial chemical attack. Additional procurement and research and development is required before we can sustain combat operations in a chemically contaminated environment. Additional quantities of the fielded protective masks will be procured to assess adequate individual respiratory protection for each soldier. Positive pressure shelters for medical and rest facilities will be added to the inventory. Also, positive pressure collective protection systems need to be integrated into our command, control, and communication and combat vehicles.

The FY 82 Chemical program expands our efforts with academia and industry to broaden the technology base required to support materiel needs. Development will be completed on a new protective mask and a biological detection and warning system. Development will continue on an aviation respirator system, numerous items of collective protection equipment for shelters, vans and tactical armored vehicles. In the chemical agent detection and alarms area, development will continue on a remote sensing alarm, a detector kit for chemical agents in water, an automatic liquid agent alarm, an alarm training simulator, and a chemical attack warning and transmission system. Work will also continue on decontamination systems for clothing and a rapid decontamination system for tactical vehicles. Approval of our FY 82 and subsequent year's requests is needed to provide solutions to our known critical deficiencies. However, changes to our initial FY 82 budget proposal no longer provide the balance to improve both defenseive capabilities and our retaliatory capability.

FIELDING OF NEW EQUIPMENT

Integration of new equipment

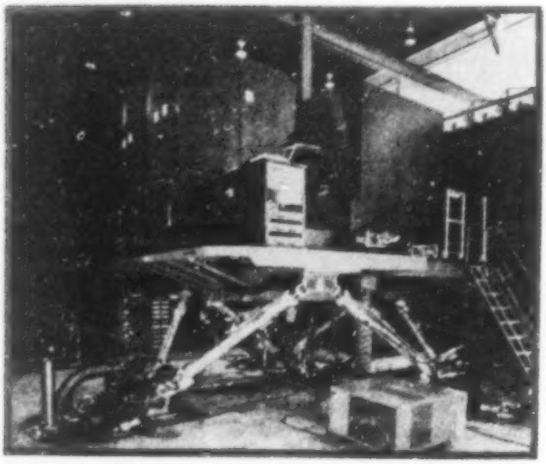
Next let me cover briefly how we are managing the integration of such a large number of new systems into the force. The Army force modernization coordination Office (AFMO) was established 2 years ago to monitor and coordinate every aspect of fielding our new weapons. Both developers and users are provided with complete data on the characteristics, capabilities, and numbers of systems they will be receiving or working with. The field then reports resource needs in areas such as construction required to support a new item, manpower and fuel needed to operate it, repair parts, and other logistical demands. Over 400 systems are involved many of which are familiar to us all--the tanks, the helicopters, etc. But many other less glamorous things like test equipment, radios, battery chargers and new uniforms are also essential to the success of modernization. All of these items generate expenses for major commands of the Army over and above that needed for normal operations.

Aviation simulators

Procurement of AH-1 Cobra flight and weapons simulator systems will continue. This simulator enhances both pilot and gunner skills and permits simulated firing of the TOW, 2.75" rocket, 7.62mm machine gun, 40mm grenade launcher, and 30mm machine cannon.

AH-64 simulator

The FY 82 Budget request also provides a minimal level of RDT&E funding for the AH-64 Combat Mission Simulator engineering development; because of this funding level, we do not expect to field the first prototype trainer until FY 87. This is over two years after the production fielding of the Advanced Attack Helicopters.



Black Hawk Synthetic Flight Trainer

Blackhawk simulator: type-classified

It is anticipated that operational and developmental testing will be completed in FY 1982 which will lead to type classification standard of the UH-60 Black Hawk Flight Simulator.

Maintenance and fire trainers for armored vehicles

Finally, in the armored vehicle area, procurement will be initiated on trainers and conduct of fire trainers for selected vehicles: The M60 tank, the Abrams Tank, and the Fighting Vehicle System.

The knowledge and experience gained from our new training devices will go a long way in helping our soldiers prepare for combat situations.

BALLISTIC MISSILE DEFENSE

The US Ballistic Missile Defense (BMD) research and development program, the Army's only strategic forces effort, is a continuing program to provide a hedge against the strategic uncertainties associated with the threat of ballistic missile attack on the United States and to maintain the US leadership in ballistic missile defense technology. For some 25 years, we have been involved in this unique and important effort. Since the demise of SAFEGUARD, the US has no deployed BMD capability. The BMD program gives the US the option to develop and deploy rapidly the most effective BMD system permitted by technology at any future decision point.

The BMD program conducts R&D which advances BMD related technologies and provides a systems technology base for future strategic defense applications. These capabilities are becoming increasingly important as the threat to vital strategic assets continues to grow. Two very promising defense concepts--the Low Altitude Defense (LoAD) System and the Layered Defense System--are being emphasized.

LoAD

The LoAD System would employ very short range nuclear armed missiles and small phased-array radars for the defense of hardened strategic targets such as the MX. The proposed MX system will have a number of possible locations for each MX missile. This means that an attacker must target all shelters to assure hitting the MX. The addition of LoAD to protect the shelter containing the MX (intercept of a single warhead) would require an aggressor to double his attack in order to insure killing the MX. Thus, intercepting this one warhead is equivalent to doubling the number of MX shelters.

Layered Defense System

The LoAD system could also be used as the bottom layer of a Layered Defense System, a concept which employs two tiers of defense and is particularly attractive for defense of targets where low penetration probability is critical. The top layer, or overlay, features optical sensors to detect, discriminate, and track targets in space and non-nuclear kill vehicles to maneuver and eliminate the threats prior to their reentry of the earth's atmosphere.

Other roles

Although ICBM defense is considered to be the primary potential role for BMD, other important roles also exist and are being addressed in the BMD Program. Other roles for the Layered Defense include protection of SAC bases (bombers and air launched cruise missiles), critical communication nodes, and the locations of key decision makers. All strategic elements launched from airfields are potentially vulnerable to surprise attack by SLBM. By pursuing LoAD and Layered Defense, the BMD Program retains defense options for many different applications. In addition, the long wave length infrared (LWIR) BMD technologies now being demonstrated and matured in the exoatmospheric defense experiments have potential application for augmenting or reconstituting early warning and attack assessment sensors.

Program Elements

The US BMD R&D effort consists of two complementary program elements--the Advanced Technology Program (ATP) and the Systems Technology Program (STP). The ATP is designed to advance BMD-relevant technologies and to explore potentially revolutionary system concepts. The STP integrates those technologies suitable for transition to systems applications into a systems context and validates the integrated technologies through high fidelity simulation and/or laboratory and field testing. ATP is funded at level of effort with an FY 82 budget request of $130 million, a $6 million increase from FY 81. The STP FY 82 budget request of $216 million reflects an increase, mostly in support of the LoAD effort, of $71 MIL over FY 81. However, the increase does not fund other BMD options which could be pursued if additional funds were available.

FY 82 funding

Kwajalein Missile Range

The BMD Program Manager also manages the Kwajalein Missile Range (KMR) and serves as the National Range Commander. The simultaneous use of KMR for both strategic offensive and defensive testing provides a unique opportunity to collect realistic data vital to both programs. The synergism which results from this joint testing is valuable for both offense and defense. The opportunity for the BMD Program to observe and analyze these developmental and operational ICBM firings permits cost savings measured in tens of millions of dollars during each fiscal year. Kwajalein is the only range in the free world which can accommodate full-scale ICBM tests with sophisticated data collecting for the terminal portion of the trajectory. It is thus a unique national resource, utilized by all three services, NASA, and other government agencies.

In FY 1981, the BMD Program emphasized work on the LoAD pre-prototype demonstration and development of the optical sensor capability for the overlay concept through a series of experiments. One of these experiments, the Designating Optical Tracker (DOT) is validating the use of optical sensors for BMD functions through a series of flight tests. The fourth flight of the series takes place in FY 1981.

Another important experiment, the Homing Overlay Experiment (HOE) builds on the knowledge gained from the DOT flight to demonstrate optical homing and non-nuclear kill. Development of the HOE continues with assembly of the HOE interceptors to occur in FY 1981.

Homing Overlay Experiment

FY 1982 will see the Homing Overlay Experiment coming to maturity along with the continued development of the LoAD in its pre-prototype demonstration. The HOE will complete assembly and test of the interceptors, system integration, and ground tests, all leading to first and second flight tests during the year. Systems engineering for the LoAD along with hardware/software development and testing will continue.

A strong BMD R&D program provides timely defense options in a period of great strategic uncertainty. The Soviets continue to deploy a new generation of highly accurate ICBMs capable of carrying multiple independently targetable reentry vehicles. Each reentry vehicle has the potential to threaten the survivability of the US silo-based ICBM. In the recent past, further improvements by the Soviets in missile accuracy, the testing of upgraded models, and the continued development of yet another generation of missiles all add to the mounting evidence of our ICBM vulnerability. BMD systems now possible with contemporary technology could enable effective and resilient ICBM defense with favorable cost exchange ratios. This could provide a disincentive to offensive arms proliferation.

CONCLUSION

The FY 82 budget request represents our best effort to provide a balanced program to equip the Army; however, due to resource constraints a number of our programs are not funded at an optimum level. Our major concern is that our rate of progress is not sufficient in providing our soldiers equipment that is at least qualitatively equal to that held by the Soviets. Never before has the Army had the opportunity to field as many new systems with as much payoff potential as it does now, and at a time when we are faced not only with much obsolete equipment but equipment shortages in virtually every functional area. It would be a national tragedy if, after years of successful development, these systems were produced at such a low rate that the full range of benefits were not available to all our soldiers in the field. Since so many of our new systems are at or near the procurement stage, the main determinant of how long it will take us to forge a credible equipment posture is the adequacy of funding. Accordingly, we need the strongest Congressional support possible.

BIOGRAPHY
LIEUTENANT GENERAL DONALD R. KEITH, USA
DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT & ACQUISITION

Lieutenant General Donald R. Keith was born January 31, 1927, in Ludington, Michigan. He was graduated from the United States Military Academy at West Point in the Class of 1949 and commissioned a second lieutenant of Field Artillery. He received his Bachelor's Degree from the Academy and earned a Master's Degree from Columbia University in 1958 preceding a faculty assignment in the Department of Physics and Chemistry at West Point.

Some of General Keith's key duty assignments in his more than 28 years of active military service include Commander, 5th Battalion, 73d Artillery, and Commander, 36th Artillery Group in Europe; Director, Research and Analysis Directorate, US Military Assistance Command, Vietnam; numerous positions on the Army General Staff including an assignment in the Office of the Chief of Staff, Director of Developments in the Office of the Chief of Research and Development and Director of Weapons Systems in the Office of the Deputy Chief of Staff for Research and Development. Most recently, General Keith served in the top Field Artillery assignment of the US Army as Commanding General, US Army Field Artillery Center and Commandant, US Army Field Artillery School, Fort Sill Oklahoma.

Among his military schools attended are the Field Artillery School, the Command and General Staff College, Armed Forces Staff College, and the Industrial College of the Armed Forces.

Among his decorations, General Keith has been awarded the Legion of Merit with two Oak Leaf Clusters, Bronze Star Medal, Meritorious Service Medal, the Army Commendation Medal with Oak Leaf Cluster and numerous foreign awards and service ribbons.

General and Mrs. Keith, the former Erika Krausse, have one son, First Lieutenant Michael Thomas Keith, US Army. 1LT Keith, a 1977 graduate of the US Military Academy, is currently serving at Fort Riley, Kansas.

General Keith assumed his duties as the Deputy Chief of Staff for Research, Development, and Acquisition on 31 October 1977 and was pinned with the rank of Lieutenant General on 4 November 1977.

SUBMITTED QUESTIONS

Senator **Stevens**. We have additional questions which we will submit to you for response in the record.

General **Keith**. Yes, sir.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

Questions Submitted by Senator Stevens

Senator Stevens. What is the increase for Research and Development for the Army in the amended budget over the January budget?

General Keith. The net increase is $328.0 million, which consists of $504.9 million in program increases offset by $176.9 million in decreases resulting from efficiencies and revised inflation indicies.

Senator Stevens. What is the impact of the change in inflation between the January budget and the amended budget?

General Keith. The application of the revised inflation indicies to the Research, Development, Test and Evaluation (RDTE) budget, reduced the Army's request by $56.0 million. This reduction was distributed to all RDTE programs, for minimal impact on individual programs.

Senator Stevens. When the impact for the change in inflation is considered in the amended budget for Research and Development, what funding remains for Research and Development overhead and programs?

General Keith. After applying all reductions to the FY 1982 amended budget (to include the $56.0 million inflation), a total of $3.90 billion is available for overhead and programs. This represents a net increase of $328 million in the amendment.

Senator Stevens. What were the most significant increases in the amended budget for the Army?

General Keith. The most significant increases for RDTE,A are as follows:

PATRIOT - +$26.0. Additional OSD directed testing and ground support equipment.

STINGER - +$12.0. Completes STINGER-POST program one year early.

Chemical Demilitarization Facilities-Johnson Island - +$8.0. Develop technology for demilitarization or destruction of hazardous toxic chemical warfare agents.

DARCOM Major Range/Test Facilities - +$22.0. Permit some essential modernization of major test range instrumentation.

Improved HAWK Modification - +$10.0. Develop tracking and RAM-D modification kits for I HAWK.

Theater Nuclear Warfare-155mm - +$33.0. Funds development deferred by previous administration.

GRASSBLADE - +$9.0. Finalizes engineering planning and insures hardware components are ready for production.

Counter Lasers - +$12.0. Support the Army Laser Countermeasures/Counter-Countermeasures plan.

LoADS-BMD Technology - +$90.0. Acceleration of the Low Altitude Defense Prototype Demonstration program to provide for an earlier initial operational capability.

Joint Tactical Fusion Center - +$46.0. Continuation of the Joint Tactical Fusion programs; simulation efforts, operational testing, joint exercise participation, and prototype fabrication.

Fighting Vehicle Systems - +$50.0. To cover shortfalls in skill performance aids requirements, test, measurement, and diagnostic equipment and integrated logistics support.

M1 Tank Block I/II Improvements - +$17.0. Develop improvement packages including nuclear, biological, chemical protections, ballistic armor protection, an auxiliary power unit and weight reduction.

Chemical/Biological Defense Technology - +$48.0. Provide expanded technology for accelerated development of new and improved chemical-biological defense equipment.

REMBASS - +$7.0. Fully fund the program to meet an FY 84 initial operational capability for hand emplaced system.

Advance Rocket Control System - +$15.0. Continue development of a classified project.

RPV FLIR - +$15.0. Accelerates start of the FLIR mission payload full scale engineering development.

Theater Nuclear Forces C^3 - +$16.0. Funds command automated aids to improve emergency action message processing time and system responsiveness.

Senator Stevens. Now that many of the Army's major developments such as PATRIOT, XM-1 Tank, BLACKHAWK helicopter, attack helicopter and others are in or ready for production, what systems is the Army developing that will require significant funding in the future and how will such systems impact on the on-going procurement of the present systems?

General Keith. As our current modernization effort is either in early production or will be soon, we are investing more heavily in improving current systems, basic technology and technology demonstrations to make more rapid improvement in equipment available, to reduce our risks in future developments and to minimize technological surprise.

To assure affordability, it is our policy to utilize preplanned product improvements for systems in development, and aggressively to pursue the possibilities of improving fielded systems to meet new requirements as an alternative to developing new systems. We also insure that the procurement impact of the systems which will emerge will be evaluated as part of our long range planning. In the near term, we are developing, or plan to develop, the following potentially major systems: the Division Support Weapon System (DSWS), Infantry Man-portable Antiarmor/Assault Weapon System (IMAAWS), Corps Support Weapon System (CSWS), Stand-Off Target Acquisition System (SOTAS), Mobile Protected Gun (MPG), and Lightweight Air Defense System. They are affordable within our expected procurement funds.

M1 ABRAMS TANK

Senator Stevens: What is the Army's program for production of the M1 tank in Fiscal Year 1982 and subsequent years?

General Keith: We are asking for funds to produce 720 M1's in the FY 1982 funded delivery period. In FY 1983, we plan to fund 802 M1's and then 1080 each year through FY 1987. In FY 1988, we plan to stabilize production at 60 per month (720 per year).

M60 TANK PRODUCTION

Senator Stevens: What is the Army program for continuing the production of M60 tanks and M1 tanks simultaneously?

General Keith: The Army would like to maintain the M60 production capability until the M1 production base is adequate to rapidly respond to any tank mobilization requirement. Exactly how long we maintain the M60 base will have to be evaluated on a month-by-month basis. As you have heard, the M1 base is progressing pretty well, but it is not totally demonstrated yet. The FY81 Supplemental tanks we hope to buy will keep the M60 base warm, and factoring in the foreign military sales cases gives us some breathing room for a few months until all the evidence is available to determine whether we should fund M60 further.

M60 TANKS

Senator Stevens: Does the Army intend for the next decade to have a mix of M60 and M1 tanks?

General Keith: Yes, we plan to have a mixed tank fleet at least through FY2000.

Senator Stevens: What is the comparative cost of the latest version of the M60 and the M1 tanks?

General Keith: We have requested $143.0M in the FY81 Supplemental to purchase 120 new production M60A3 tanks. We requested $1354.5M in the FY81 original budget and the Supplemental to purchase 569 M1 tanks. Using this as the basis for comparision, the unit cost of the M60A3 is $1.19M and the unit cost of the M1 is $2.38M.

Senator Stevens. Last year in consideration of the Fiscal Year 1981 budget, concern was expressed relative to the Army's air defense systems. What is the Army's program as expressed in the Fiscal Year 1982 budget request for air defense systems, including Patriot, Improved Hawk, DIVAD and Stinger?

General Keith. The FY82 budget request includes $226.3M in RDT&E and $2404.0M in procurement for a total of $2630.3M for air defense programs. Individual system requests include:

SYSTEM	RDTE REQUEST ($M)	PROC REQUEST ($M)	TOTAL
Stinger	16.2	224.3	240.5
DIVAD	30.0	431.2	461.2
Grass Blade	29.9	151.0	180.9
AN/TSQ-73 Mods	0.5	3.1	3.6
Advanced Rocket Control System	15.0	0	15.0
Chaparral	19.7	68.4	88.1
I-Hawk	39.6	83.7	123.3
Roland	4.0	529.3	533.3
Patriot	58.0	900.5	958.5
AD Targets	0	8.3	8.3
AD Ammunition	0	4.2	4.2
SHORAD Command and Control	13.4	0	13.4
TOTAL	226.3	2404.0	2630.3

Senator Stevens. How many helicopters are requested in this budget? Please provide the numbers by mission and type of helicopter.

General Keith. In the FY 82 Amended Budget, the Army is requesting 14 Advanced Attack Helicopters and 96 UH-60A BLACK HAWK helicopters. The Advanced Attack Helicopter provides a highly mobile, heliborne anti-armor capability which can operate both day and night and under adverse weather conditions. It is armed with HELLFIRE missiles, 30mm cannon, and 2.75 inch rockets. The UH-60A BLACK HAWK is a utility helicopter which provides a highly-maneuverable, air-transportable, troop-carrying capability for all intensities of conflict, without regard to geographical locations or environmental conditions. It can move troops, equipment, and supplies into combat, and also perform multiple functions of aeromedical evacuation and crash rescue during day and night, under visual and instrument conditions, including moderate icing.

Senator Stevens. What is the status of the attack helicopter and have the problems that were experienced by the attack helicopter been resolved?

General Keith. All the technical problems for the Advanced Attack Helicopter have been or are well on the way to being resolved prior to the production decision on 1 December 1981.

Senator Stevens. What is the status of the existing chemical warfare weapons and what is the urgency to develop the binary chemical weapons?

General Keith. The current US chemical munitions stockpile is [(Deleted)] in quantity as well as weapon and agent mix to support the national policy of deterrence of chemical warfare. Of the approximately [(Deleted)] agent tons in serviceable and repairable munitions, only [(Deleted)] agent tons are serviceable, and of this amount, only [(Deleted)] agent tons are in munitions which are ready for issue. Today, under mobilization conditions, it would require approximately [(Deleted)] to make the remaining quantity (Deleted agent tons) of munitions available. In addition to the quantitative and qualitative limitations, there are other serious concerns. First, serviceability or live fire testing of chemical munitions was discontinued in 1969. Deterioration of munition components, however, is known to occur as the result of reaction of the agent fill with the metal components. The ballistic inferences of this degradation cannot be determined and, as a result, the actual serviceability of what limited quantities we have is unknown. Similarly, 155mm artillery munitions which compose approximately [(Deleted)] of the total munition stockpile, have not been test fired with the enhanced range weapons and cannot be fired, therefore, at the maximum weapon range [(Deleted)] Currently, the 155mm chemical munition is [(Deleted)]

During the 1980's, the stockpile will decrease further through age and obsolescence. The M55 rocket is a good example of both obsolescence and munition deterioration, in that the single purpose launcher has been withdrawn from the force, and the number of "leakers" has reached such substantive proportions that destruction of the total inventory of rockets is dictated. It is projected that by [(Deleted)] the usable stockpile may be as little as [(Deleted)] agent tons, principally as the result of obsolescence.

What is required is a stockpile capable of engaging the enemy to the total depth of the battlefield -- putting in jeopardy his second echelon units and interrupting his ability to logistically support his forces. In short, a capability to retaliate "in-kind", denying every advantage the initiator seeks to gain through the use of chemicals. Binary modernization provides us the opportunity for acquiring such a credible deterrent stockpile -- one which does [(Deleted)] today -- composed of the proper mix of agents in usable air and ground munitions.

Senator Stevens. Has the Army included funds in the Supplemental and Fiscal Year 1982 budget request to equip the facility that was funded in military construction at the Pine Bluff Arsenal for binary weapons? If so, how much?

General Keith. Yes, the Army requested $20 million in the FY 81 Supplemental budget to provide the necessary chemical process plant equipment and install it in a $3.15 million renovated facility, provided for by Congress in the FY 81 MILCON bill.

Senator Stevens. If the Congress were to approve the funding to equip the plant at the Pine Bluff Arsenal, when would production of binary munitions begin?

General Keith. Once the facilitization contract is awarded, it would take approximately 27 months before we are in a position to produce binary munitions. However, the decision for production has not been made. Should this decision be made, the President will certify to the Congress that the production of chemical munitions is essential to the national interest.

RESUMPTION OF OPEN SESSION

Senator STEVENS. All right, then, let's open it back up.

General KEITH. All right.

[Whereupon, at 9:40 a.m., the executive session concluded and the committee reconvened in open session.]

Open Session

STATEMENT OF ARTHUR DAOULAS, ACTING ASSISTANT SECRETARY OF THE ARMY (RESEARCH, DEVELOPMENT, AND ACQUISITION)

ACCOMPANIED BY LT. GEN. DONALD R. KEITH, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION

Department of the Army

COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE

Senator **Stevens**. Go right ahead, General.

General **Keith**. We are going to turn now to a mission area which we call command, control, communications, and intelligence, sir, to go over the Army's program there.

SINGLE CHANNEL GROUND AND AIRBORNE RADIO SYSTEM (SINCGARS)

I am going to begin with the SINCGARS radio which is the tactical radio for the Army in the future. It is a single channel ground and airborne radio and that is from which the name is derived. It is going to give all of our combat units a jam resistant securable radio system capable of operating in all combat environments.

The fiscal year 1982 request will support the fabrication and testing of models from three competitors. We are to, if we can, because of the urgency of the requirement for this radio, shorten the development cycle by about 2 years. If these prototypes test out well in advance development, we intend to go directly from there into our acquisition scheme.

TRI-TAC

The TRI-TAC program is a joint tactical communications program that is managed out of the Office of the Secretary of Defense. It has a whole suite of equipment that comes together in an interoperable way so that all of the services and the defense agencies are by design able to operate one with the other.

The Army's part of this has been primarily to develop the two switches that are the backbone of this system. There is one which is a circuit switch, that is for voice, secure voice transmissions, and a message switch which handles digital message, hard copy kinds of things, Ma Bell and Western Union in field, if you will. These will replace equipments which are now largely 1950's technology, manual and completely nonsecure. They are manpower intensive and quite inefficient.

The family of TRI-TAC equipment will provide for evolutionary transition from this analog kind of suite of equipment into the digital world just as we have commercially. It also has both hardening for nuclear effects and also the hardening for electronic countermeasures.

The R.D.T. & E. funds that are requested are for our portion of the TRI-TAC office and a joint test facility where they are testing all of these various pieces that are being developed by the services.

The other items that the Army is responsible for are included in that request and in the procurement request is our first procurement of the switches which have completed development.

TACSATCOM

The Army is also responsible for the ground terminals for the satellite communications system for all services. That TACSATCOM is tactical satellite communications. There is a picture of what a typical terminal looks like. The current program consists of a single-channel, ultrahigh frequency system which supports nuclear storage sites. Those items are in production with first deliveries this month.

The multichannel system is in the superhigh frequency range. That is also beginning production. It will have an IOC of fiscal [deleted].

Then there is a manpack UHF terminal primarily for special forces kinds of operations that will begin production this fiscal year.

POSITION LOCATING REPORTING SYSTEM (PLRS)

The PLRS system is an acronym for position location reporting system. This program was started by the Marine Corps and now has been handed off for management to the Army. It is still joint with the Marine Corps. It provides combat commanders with automatic precise location of their forces and navigation information for these forces. That is, those small user units that you see there can tell a battalion commander where his unit is on a grid on the ground and he can be vectored to go some place and be given directions out of a data link that connects these systems.

It also tells a division commander where all of his subordinate units are. So on a very fast-moving battle field he will be able to better manage and better position his critical combat assets.

Senator RUDMAN. What is the proliferation of these in a combat command? Are they with armored units or infantry units?

General KEITH. They will be down to company level in the Army. It will be ultimately, as I get down to the PLRS/JTIDS, a system that will not only both locate and help navigate units but also will provide the backbone of our total digital distribution system.

Most all of this command and control information in the future is going to consist of digital data just like we are doing in the business world today rather than long voice conversations which are subject to intercept and subject to jamming.

Let me take you to the next one there, that PLRS/JTIDS combination which has been the acronym Army data distribution system, ADDS. JTIDS is an Air Force development. It stands for joint tactical information distribution system. It is the Air Force's way of passing from airborne sensors like the AWACS, the information from that radar down to ground stations.

We found by looking at the combination of those small user units in PLRS that the terminals that are used with the JTIDS, so-called class II terminals, which is a little more capable computerwise, that by marrying those two together we could provide an integrated system that would handle all of our data distribution problems in ground combat units up to the division and also handle the position location job.

The idea was not to proliferate all of these kinds of things out there and to try to find one set of things that would do all of the jobs. We are in the concept formulation stage there and so far so good. It looks like we are going to be able to do that. If we do, it will be a much less expensive and much less maintenance burdensome kind of overlay system for the future command and control system for our Army.

STANDOFF TARGET ACQUISITION SYSTEM (SOTAS)

Now I want to turn to the system we call SOTAS. That is the standoff target acquisition system. It is the most significant of all of the intelligence in target acquisition systems that the Army is pursuing. It involves putting a radar onto the bottom of a standard Black Hawk helicopter. It allows for looking at over [deleted] kilometers in depth with that radar being able to see moving targets and with a digital data link down to be able to paint on a TV screen targets that are moving out there.

Literally at a command post you can sit and see the enemy formation getting ready for an attack. You can see where the main attack is coming and you can see where lucrative targets are beginning to form up that you might be able to attack before he ever closes with you.

We have had a proof-of-principle system that was a brassboard modification of an old radar on the bottom of a Huey. We took it to Europe and [deleted].

[Deleted] it worked just as advised. It was so impressive to our two corps commanders over there that they asked to keep those two advanced development models to give them some capability to do that today.

[Deleted.]

If you can imagine being both able to perform battle management, that is to position your forces when you are outnumbered, how important that is to a division commander, and further to be able to get data that is accurate enough to be able to begin picking away at him with indirect fire and whittling him more down to size, you can see why the Army is so intent on acquiring this capability. That is the good news.

The bad news is that last October, after we got on an engineering development contract, we had our first critical design reviews and in fact our projections of the difficulty, the technical difficulty in both the radar and in the secure-down link were optimistic. That down-link, by the way, will be common for the remotely piloted vehicle, the RPV, and also for the Air Force's position location strike system, PLSS.

Again, we are trying to efficiently solve more than one user with one development to save money. We found though that while the designs were solid that our optimism in being able to get through it in a foreshortened period, because we had after all demonstrated its feasibility with the system that I described in Europe, was wrong.

We slipped the program almost 2 years—21 months—taking a bold shift figuring there is no sense in dribbling out the bad news and coming back to the well for more money and more time, overtime. So we made a bold adjustment and told everybody the bad news and that was a part of what was in this last SAR report that said this thing is blown, both in time and in dollars. I am just telling you that we did what we thought was right.

I have been around long enough to know that bad news doesn't get any better as you dribble it out and we just decided we were going to make a bold adjustment and do what we thought was right.

SOTAS ESTIMATES

Senator **Rudman**. What is the magnitude we are talking about here as to what you thought, what the original plan was and where your best estimate, and I understand that is difficult, is at this time?

General **Keith**. As I said, 21 months of scope, of engineering development scope of work longer and that is going to cost us money.

Senator **Rudman**. Can you give me an idea of what your original thoughts were in the engineering development?

General **Keith**. Are you talking dollars or time, sir?

Senator **Rudman**. Dollars.

General **Keith**. The original dollars, I can get it for the record or I can look it up in the cards. We have more than doubled the engineering development dollars to do this job.

Senator **Rudman**. Was this in the order of magnitude of a $50, $60, $70, or $80 million program?

General **Keith**. It was more than that, sir. I will have to get the precise number.

Senator **Rudman**. Who was the contractor on engineering on that?

General **Keith**. The prime contractor on this is the Radar House. I will say General Dynamics built the first model and Motorola won the head-to-head competition for the engineering development followon but they underestimated. But I will have to tell you at the same time that our Government people looked at both of those proposals and we did, too. We just goofed.

Senator **Rudman**. Now do you have the order of magnitude there in front of you?

Mr. Chairman, I hope you don't mind my pursuing this because I think it is one of the most significant things that we have to look at of where these things historically start and where they go in terms of getting a real idea of what we have to spend.

Senator **Stevens**. No, go right ahead.

Senator **Rudman**. If it is difficult now, General, it doesn't really have to be answered today, but you can just get an answer to us.

General **Keith**. I have a slide for that that I can put up. This is the total program as reported. We submit a selected acquisition report along with the budget each year. So this would be along with the 1981 budget request and this one would be along with the 1982 budget request that we have just submitted.

The impact of the schedule slip alone, as you can see, is $112 million. The total program differential is as escalated for both the impact of the stretch in engineering development, then starting to procure a higher-priced item because of what we have learned as to the difficulty of that and then escalating it all the way out to the end of the program, which in this instance would take it out to about 1990 compounding the escalation every year, so you can see that that contribution, just the pure arithmetic, is almost $800 million worth. But very clearly here are two big contributors that said we goofed.

ORIGINAL PROGRAM COSTS VERSUS CURRENT EXPENSES

Senator Rudman. Well, not knowing how your charts are prepared, let me see if I can ask a very specific question which you may not be able to answer today but which you may well be able to answer for me in the coming days for the record, and that is this. What was the actual original program out to whatever year, 1988 or 1990, cost of this program to the point where it was ready to be acquired in quantity versus what your estimate is of that right now?

General Keith. That is those two numbers right there, sir. As I said, it has more than doubled.

Senator Rudman. It was $968.8 million and we are now to?

General Keith. $2.4 billion. But now remember, sir, please, that while that is nothing to be very proud of, it is not 2.4 times as expensive a program on a constant year dollar basis. We must do the arithmetic of compound escalating. If we slip this thing out 2 years, and we start production 2 years later, we have got two more years of compounding escalation that we have to do that says that of that $2.4 billion $800 million of it roughly is just plain arithmetic.

COST EFFECTIVE ANALYSIS—SOTAS

Senator Rudman. Let me ask you this question then because this really gets to the heart of what I really want to ask you about, General. When the original plan was submitted to the commander of the Army that made the decision that this was something that was desirable from a tactical point of view in the battlefield there decision was made and I assume there was some cost-effective analysis that goes into that.

General Keith. Yes, sir.

Senator Rudman. With this kind of gradation of numbers do we then come back to that group within the Army that makes cost effective studies as to whether you are going to buy things or not and decide whether or not the program ought to be continued in that is it now cost effective at $2.5 billion where it may well have been cost effective at $900-whatever million? I mean, do those kind of decisions get approached and do they get made or do we just decide that we are just going to keep going?

General Keith. Yes, sir. Last October when this happened to us the program manager brought it into the building. We had his best estimates of what the program was due to the interaction with this contractor. We made as much of a decision as we could at that point but sent him back to get these cost things up through the normal cost validation process that we normally get them. That is, we have independent costers who do this for us and not just the program manager. They are in the Comptroller's set-up at the various levels of command.

So we sent him back. We will meet, I believe it is on April 17 to get all of the options for this program for the final decision.

But in October when we were beginning to formulate President Carter's budget with these new numbers and running back through the cost effectiveness analysis as best we could, and that was the best estimate we had, the Army made a decision to afford it even in the constrained Carter budget. It was that important to us. Affordability is a relative thing. The way we do that is that we array from 1 to 99, or whatever, down a priority list and when we get our dollar level we draw a line and that is the end of it.

We afforded this in the constrained budget because it is the only thing that we have to be able to perform this function and that function to us is so important to be able to anticipate where that fellow is coming from and to be able to target for attack the critical elements of his force, and it is just very important.

SOTAS ALTERNATIVES

Senator **Rudman**. Is there, to your knowledge, any even vaguely duplicative program contained within the Air Force with Air Tactical Air which has the ability in fact to feed this kind of information to Army commanders on the ground?

General **Keith**. We had a very thorough look-see at that. There are several airborne radars. There is one on the TR-1, a radar called SARS, Synthetic Aperature Radar System, but it does not see moving targets. It paints the ground so you cannot see movement. It is a very, very large system as well and a very complex trailer park, if you will, full of equipment on the ground.

There is another Air Force program that is a part of the assault breaker program that I described earlier, the technology demonstrator. The paved movor radar in that program is an advanced development at about brassboard level of radar. It can see moving targets, but it is right now focused only on that closed loop of finding a target and providing midcourse guidance from these rockets that are launched. The operational concept for that is being formulated.

I think more importantly its ground station again is a rather large complex. It is a big installation. It takes a B-52, an FB-111 or a C-130 to carry it. It probably could be modified to do this job, but off the top we said not for a long, long time because of its maturity and probably not any cheaper because radars tend to come dollar per pound.

Most important, if we pursue this, we can have the next generation in the hands of commanders in Europe and Korea with the engineering development models if we pursue like what we did before in [deleted].

Senator **Rudman**. I think you have answered my question. Thank you.

Senator **Stevens**. Why can't you use AWACS for this same thing?

General **Keith**. AWACS is able to handle the movers at velocity gates that are of interest like slow-moving trucks, tanks, and so on. We would have to modify it, and again that is a hugh, round complex that would have to be somehow fed into the forward area.

Recognizing this thing is up in the division area, you have division and brigade commanders who need that information now to position their forces.

Senator **Rudman**. Well, it is obvious that it is very desirable. Nobody could argue that. But the question is at what point does it become desirable and that of course is something that obviously I don't know the answer to.

General **Keith**. Believe me we didn't want to have to come and give you this news. But by the same token I think it is better to come all the way up front and tell you where we are right now and recognize what we have got to do to fix it.

Senator **Rudman**. It is probably a lot safer.

REMOTELY PILOTED VEHICLE (RPV)

General **Keith**. I hope so, sir. We need it badly.

The last item that I am going to talk about is the RPV. The RPV, as you know, is a very small unmanned aircraft. It is capable of carrying in its nose a very small sensor. The first generation sensor is a little TV camera. It can when cued by something like the SOTAS can be sent up [deleted] kilometers beyond the forward edge of the battle area and seek out and target precise targets to be fired upon by things like the Copperhead rocket. It has in its sensor package, in addition to the little TV, it has a laser designator. It can find the target and actually put the laser energy on the target, and we have demonstrated this, and close the loop.

The RPV program has that same data link that we had trouble with in SOTAS. So it also has had to slip a bit waiting for the data link and we are not going to be able to get it as rapidly as we had hoped.

The R.D.T. & E. request is to fund the full-scale development of this capability and during 1982 we will be demonstrating the full-flight capability first with an interim data link [deleted] just so we can get on with the program and then later on as soon as the [deleted] data link is ready we will circle back and prove it with that capability.

Senator **Rudman**. Is that truck transport or the truck launch?

General **Keith**. It is, sir, and truck recovery. There is a device that unfolds to catch that low bird when it comes back in.

Senator **Rudman**. What speed does that fly at?

General **Keith**. My guess is that it is around 50 or 60 knots, or something like that. It has a very, very low radar cross-section. It has been calculated by some to be about the same as a seagull. [Deleted.] We are pretty excited about this capability and getting those odds on the other side of the hill. That is an advance development net that was simply staked into the ground out at Huachuca where we tested it for proof of principle.

The last area that I am going to cover, sir, is in combat support. There are a lot of things here that are not as glamorous as some of the larger systems but clearly the Army cannot go to war without these kinds of things. So I think it is important to run through them rather rapidly.

SCATTERABLE MINES

One area that is quite exciting is in the mine area. If you hark back to the days of World War II and even Korea mines were man emplaced, were very large tonnage items and it took both combat engineer troops and combat infantry troops hours and hours to get them in the ground, and then if they had to recover them it was all day. It really was a very, very manpower intensive, and I might add dangerous avocation.

We have coming into the inventory now scatterable mines, a family of scatterable mines. You will see a picture up in the left of the first ones that went on site in Europe. They are helicopter delivered out of little dispensers.

Down below you see one that is simply spewed out the back of a trailer-like device that goes behind either a wheeled or a tracked vehicle. In the center you see artillery delivered mines. We have antipersonnel and antitank mines that are packaged up into artillery shells that break open and scatter the mines over an area on the ground. Then there are of course some that the Air Force have that are delivered out of dispensers of fixed-wing aircraft.

The beauty of these is that you can surgically put them out rapdily wherever you want to. Again, with a SOTAS, if you know where that fellow is coming, you can get firing data on guns, preplan the delivery of these scatterable mines in his path. He has got to stop or do something in order to avoid them. That is the point in time when with RPV's or whatever else you can begin to kill him out there. So it is the synergism of all of these things working together that gives you a pretty exciting capability.

As I say, we are in production on most of these things now. The last R. & D. dollars are for a box version of these that can be hand emplaced with either special forces or a rapid deployment force kinds of fellows that on command, a little radio signal, this box pops open and spews them out. If they don't have to use them they will never have popped it and they can pick the box back up and put them back in the truck and go, a very convenient package.

COUNTERMINES

In the area of countermine, again we have been behind the moon in our ability to clear mine fields. So we have a countermine program that has a number of mutually supporting detection and neutralization devices, including a roller that would go on the front of a tank-like vehicle. We have been improving our hand-held detectors. We have got a vehicle-mounted roadmine detector and a vehicle magnetic signature duplicator that will allow us to find these things and be able to do something about them.

Then we are doing advanced development on a fuel air explosive technique where you simply put an explosion with a high overpressure over a mined area and you blow them out rather than having to go probe for them and dig them out.

The ACE is the armored combat earthmover. As you see there, it is a special purpose, multipurpose kind of piece of equipment that has a dozer blade and has other capabilities, but mainly it allows for the combat engineers to run with the tankers and the mechanized infantry. The standard bulldozer simply cannot keep up.

On this lethal battlefield what this guy can do to dig other people in and help them survive is very, very important. So we are beginning procurement of that item with the request that you see there of $40.7 million.

Senator STEVENS. Who makes that?

General KEITH. PACAR.

BRIDGING

Bridging is another area that is not that exciting or emotional but is certainly required in the battlefields of Europe particularly where there are many, many rivers that run laterally across any area that we are going to have to fight. We are doing research and development primarily on items of equipment for standardized bridging with our allies in the 1980's.

We are buying in addition some bridge erection boats, some ribbon bridge components, some medium girder bridges, bridge erection sets and some reinforcing sets for those existing bridges.

TRUCKS

Trucks is an area where we have had for some time a critical shortage. We are about with both the 1981 supplemental request and the amended 1982 request to get well in both the 5-ton and the 10-ton area We are very excited about a recently conducted competition in the 5-ton area on a 5-year, multiyear arrangement which got us a very good buy for those trucks that you see being requested there.

Likewise in the 10-ton area we are structuring our program for a multiyear and expect to save a significant amount of money with that acquisition strategy.

In the 10-ton area there is one special case that I should call to your attention. In order to provide a 10-ton prime mover for the Pershing II and meets its initial operating capability in Europe we have had to go to an existing 10-ton that is manufactured by MAN in Germany. There are 57 of those that we are going to go on contract shortly to buy for Pershing II.

Now, the reason it is acceptable for us to take German vehicles and buy a full support package with that is that Pershing is in fact operating with the Germans now and will in wartime be side by side for that nuclear quick reaction alert capability. Therefore, it is acceptable for us to buy the German support concept of simply driving into the MAN service center. They have them strategically located all over Germany and they will use them in wartime. They mobilize them and use them in place in wartime.

The rest of the 10-ton buy will be a wide-open competition. European suppliers will be allowed to bid, but they are going to have to be able to build them in this country if they are to be considered responsive. Now we expect a good competition there as well.

HIGH-MOBILITY, MULTIPURPOSE WHEELED VEHICLE

The high-mobility, multipurpose wheeled vehicle, HMMWV, is, as its name suggests, multipurpose not only for our use in the Army but for the Air Force and the Marine Corps. In the Army we will use it as a utility replacement for some of the quarter tons that are aging and are being washed out of the fleet, all of the Mules, which are in the hands of the airborne troops right now and are all overage and falling apart, and some of the Gamma Goats, the ton and a quarter vehicle that has been with us now since the early 1960's and has not been a good story from a maintenance point of view.

We expect a broad competition from industry on this. Essentially they will be taking off-the-shelf components and assembling pilot vehicles for us to evaluate in these various roles that we will put it in, the Utility, the TOW carrier, ambulances, the Marine Corps for their forward deployed force and shipborne forces, the Air Force for their forward air controller and ambulances. It will be ultimately a very high density vehicle in all of the services.

Senator STEVENS. What about the Jeep, your announcement 2 days ago or 3 days ago?

General KEITH. We will be replacing part of the Jeeps with this, sir.

Senator STEVENS. The announcement said that the Army Tank Automotive Command in Warren, Mich., has asked for a replacement for the jeep.

General KEITH. Well, as I say, that is only partially the full story. We will replace a number of jeeps. We will replace the Mules. We will replace some of the ton and a quarters. We will replace in the Air Force some of their jeeps that are now being used in forward air controller roles. In the Marine Corps they have both Mules and jeeps to be replaced.

Senator STEVENS. Well, this announcement said that the high-mobility, multipurpose wheeled vehicle will be the replacement for the jeep and several other military vehicles, including the half-ton truck and the one and a quarter Gamma Goat.

General KEITH. Yes, sir.

Senator STEVENS. Now, is that just going to be the jeep?

General KEITH. No, sir. That vehicle will replace all of those. What we are trying to do is get rid of a proliferation of old vehicles with a high density essentially comparable component wheeled vehicle that will be inexpensive on the front end and have a broad logistics base across all services and therefore reduce the cost of ownership.

Mr. DAOULAS. Mr. Chairman, if I might add, the jeep that this vehicle will replace are the ones that are now in a weapons systems role, for example, the ones that we normally have a 106-millimeter recoilless rifle.

General KEITH. And the TOW.

Mr. DAOULAS. It will not be replacing those jeeps that are currently utilized for more of an administrative kind of function. Those in fact will be replaced with commercial equivalent types of jeeps.

General KEITH. Water is another thing that people forget about until you get interested in the desert again. The Army was made by the JCS the executive agent for water, not only the equipment but the doctrine, the training literature and everything else. In fact, it has been an area that hasn't been up front in anybody's mind until very recently.

So we have a program to acquire the necessary items of equipment for a rapid deployment force that would be sent to arid parts of the world where we could not expect to get host nation support. That is a whole host of different kinds of equipment all the way from well-digging things, purification, storage, distribution, and in fact you have to in some areas even be able to cool it somewhat because it gets so hot in the storage tanks that it can't serve its purpose with soldiers.

So the request that you see there is mainly buying things that are available. There is very little in the way of R. & D. It is mainly going out and buying the kinds of things that are required to have in the logistics system for any contingency for all forces across the Department of Defense.

PETROLEUM, OIL, AND LUBRICATION (POL)

Finally in the petroleum, oil, and lubrication, POL, area there are a number of items of equipment that the Army must have in order to perform that very important support function. Again, this runs the gamut from tanker trucks to tank mooring systems, fabric tanks, pump assemblies, hose line outfits, and so on.

Bringing these things up to snuff at this point in time is oriented on being able to support a multiservice kind of deployment if that were to be required.

Mr. Chairman, that finishes my mission area summary.

Senator STEVENS. General, would you give us the information which shows what the Carter budget would have been for these charts that you have provided us for the R. & D. and for the procurement quality in dollar signs for each function, please?

General KEITH. I can do that, sir.

[The information follows:]

Charts - Carter Budget

General Keith. The R&D and Procurement data for the several mission areas as reflected in the Carter Administration FY 82 Budget are shown below.

AVIATION
($ IN MILLIONS)

SYSTEM	IOC	RDTE	PROC QTY/$
AAH	Jan 1985	94.0	8/ 365.5
HELLFIRE	Jan 1985	24.8	502/ 96.5
AHIP	Mar 1986	39.4	-/-
CH-47D	Feb 1984	-	10/ 130.0
BLACKHAWK	Nov 1979	4.2	78/ 463.7

CLOSE COMBAT
($ IN MILLIONS)

SYSTEM	IOC	RDTE	PROC QTY/$
ABRAMS	15 Jan 1981	29.1	569/1,346.8
M60A3(MODS)	Jun 1979	-	129/ 11.7
FVS	Oct 1982	57.9	464/ 749.2
TOW II	(Deleted)	6.7	12K/ 213.7
VIPER	(Deleted)	-	44K/ 31.0

FIRE SUPPORT
($ IN MILLIONS)

SYSTEM	IOC	RDTE	PROC FU/MSL/$
PERSHING II	Dec 1983	154.1	-/ 39/209.8
CSWS	(Deleted)	20.0	-/ -/ -
MLRS	1Q FY 83	36.0	68/2,496/210.7
COPPERHEAD	Nov 1981	3.4	-/4,229/115.7
GLLD	Nov 1981	-	120/ -/ 46.8
FISTV	1Q FY 85	9.8	-/ -/ -
AN/TPQ-37	Dec 1980	-	12/ -/ 98.2

AIR DEFENSE
($ IN MILLIONS)

SYSTEM	IOC	RDTE	PROC FU/MSL/$
PATRIOT	Jan 1983	32.6	6/ 130/527.1
I-HAWK	Nov 1972	30.2	-/ -/ 4.8
CHAPARRAL	Nov 1969	20.1	-/ -/ 70.1
DIVAD	2Q FY 85	30.6	12/ -/100.0
ROLAND	(Deleted)	-	-/ -/ 65.0
STINGER	Feb 1981	4.3	-/1,974/132.7

C^3 I
($ IN MILLIONS)

SYSTEM	IOC	RDTE	PROC QTY/$
SINCGARS	Sep 1987	15.5	- -
TRI-TAC	Feb 1983	48.9	/ 102.4
TACSATCOM	Various	15.6	-/ 50.7
PLRS	Sep 1984	9.8	/ 31.3
PLRS/JTIDS(ADDS)	FY 88	19.1	-/-
SOTAS	(Deleted)	71.7	-/-
RPV	4Q FY 85	59.5	-/-

COMBAT SUPPORT
($ IN MILLIONS)

SYSTEM	IOC	RDTE	PROC QTY/$
MINES	Various	14.6	-/ 169.1*
COUNTERMINE	Various	9.5	-/-
ACE	Sep 84	-	/ 41.8
BRIDGING	Various	7.7	/ 13.7
TRUCKS			
5T	Sep 83	-	1,067/ 98.1
10T	Aug 83	-	379/ 69.4
HMMWV	Nov 84	3.1	3.6
WATER	Mar 85	2.9	/ 49.6
POL	Various	1.7	/ 53.2

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* Includes 155mm ADAM & RAAMS projectiles and GEMISS mines

SUBMITTED QUESTIONS

Senator STEVENS. We have some general questions to submit to you.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

QUESTIONS SUBMITTED BY SENATOR D'AMATO

IFV/CFV

Senator D'Amato. How does the Army plan to deal with the cost growth problem presently afflicting the IFV/CFV Program?

General Keith. The Army has undertaken an extensive cost reduction program for FVS. A massive value engineering program has been funded which includes all Army Laboratories and Commands as well as the contractors.

Production analysis contracts to investigate early competition are to be awarded in June. Manufacturing methods to reduce production costs are being pursued and the Project Manager is using "should cost," teams to determine the basis for negotiations to definitize contracts. The Army needs the IFV and CFV and is taking every possible measure to insure that costs are reduced wherever possible.

Senator D'Amato. Will cost growth in the IFV/CFV program necessitate a reduction in the quantity of vehicles? If so, what impact will such a reduction have on the Army's capabilities?

General Keith. The Supplemental 1981 and Amended 1982 budgets requested by the Army should be adequate to purchase the quantities indicated. Inflation, however, will play a major factor in whether our budgets are adequate. For example, we projected that in order to procure 600 vehicles in FY 1982 we would need $825 million. Recent inflation adjustments, however, have reduced this to $809.8 million; therefore, if inflation continues as we projected, our budgets will be inadequate to procure the quantities required.

The inability to rapidly replace the M113's with the M2 and M3 will keep the US Army behind the Warsaw Pact Forces in ground force capability. This will create a greater burden on our tank forces, degrade the infantry's ability to accomplish its mission, and decrease our overall force modernization efforts.

Administrative Use Vehicles

Senator D'Amato. Funds are provided in both FY 81 and FY 82 to replace overage and overmileage administrative use vehicles. After those funds are expended, what will be the average age and mileage of the Army's administrative use vehicles? What are the Army's standards for deciding when a vehicle is overage and overmileage?

Answer. The Army does not maintain records of the average age-mileage of the administrative use vehicle fleet because replacement requirements are based on the number of individual vehicles which meet the Army's replacement criteria within a given year. This criteria, based on a combination of age and mileage, varies by each specific type of vehicle. For example, sedans, and most light trucks must reach six years of age and 72,000 miles before they are replacement eligible while heavy trucks and buses must reach as much as 12 years and 300,000 miles before they are replacement eligible. Vehicles in the overage and overmileage category constitute the majority of the Army's replacement vehicle requirement. The balance of the replacement requirement is composed of shortages and those vehicles which exceed repair expenditure limits.

The Army's administrative use vehicle replacement criteria is shown below:

TYPE	AGE(YEARS) AND MILEAGE	
Ambulances	8	60,000
Autos: Sedan/Station Wagons	6	72,000
Buses		
37 Passenger	8	84,000
over 37 passenger	10	150,000
suburban/intercity	12	300,000
Motorcycles	5	30,000
Motorscooters, 2 and 3 wheels	5	15,000
Trailers	15	
Trucks		
7,000-18,999 gross veh weight	7	84,000
19,000-23,999 gross veh weight	8	84,000
24,000-39,999 gross veh weight	10	150,000
40,000 and up gross veh weight	12	300,000

M48 TANK MODIFICATIONS

Senator D'Amato: Funds are provided in both the FY82 and FY83 budgets to convert earlier versions of the M60 tank to the M60A3 model. Are there any plans to resume conversion of M48 tanks to the M48A5 model? If not, why not?

General Keith: The Army has no plans to resume the M48A5 conversion program. That program was completed in FY80 creating 1809 M48A5's that are now in the Army's inventory. The primary reason we do not plan further conversions is that even with the A5 configuration, the M48 is the least combat effective tank in our inventory. We would much rather spend our limited tank funds on either the much more capable M1 or more capable M60A3.

Additionally, there are only a very few M48A1's (less than 25) that are not committed to some other programed use. It would not be cost effective to restart a conversion program for that small quantity of tanks.

Senator D'Amato. What are the plans to provide attack helicopters for Reserve and National Guard units? How are shortages in New York Guard and Reserve units going to be eliminated?

General Keith. The Army has an established requirement for 1537 attack helicopters based upon current and future force structure. The Active Army and Army National Guard (ARNG) total AH-1S requirements are 963 (Active Army 557; ARNG 406). The Army Reserve units are presently not authorized any AH-1S helicopters in their inventory.

To assist in improving the near term readiness and deployability of ARNG attack helicopter units, the Army is undertaking three initiatives. First, the Army is assigning 21 early model AH-1Ss from the Active Army. Additionally, beginning April 1981 twelve new AH-1Ss which were appropriated by Congress in Fiscal Year 1981 will be delivered to the ARNG. These deliveries will be followed by seventeen fully modernized AH-1Ss in 2nd Quarter Fiscal Year 1984. Second, as the Active Army receives the fully modernized COBRA/TOWs, early model AH-1Ss will again be provided to the ARNG. Third, the AH-1Ss displaced by the AH-64 advanced attack helicopter will also be made available to selected ARNG units.

These COBRA/TOWs will be assigned to units selected by the National Guard based on their priorities and mission requirements. The assignment of AH-1Ss to New York Guard is based on these priorities.

Small Arms

Senator D'Amato. Has the Army made a decision in concert with the other services on its requirements for a new rifle and pistol? Is the Army satisfied with the progress of the joint service group working on the requirements and testing the equipment submitted for evaluation?

General Keith. All services have agreed to standardize on a single family of 9mm handguns and handgun ammunition, and have submitted a plan to the Office of the Secretary of Defense to achieve this standardization over a ten year period. The services have not yet agreed to the operational requirements for this handgun, but final approval of the Joint Service Operational Requirement document is imminent. Regarding a new rifle, the Joint Service Small Arms Program Management Committee recently completed a study requested by the House Armed Services Committee, on the requirement to replace the M16A1 rifle. This study concludes that the services should pursue a long-term rifle development program; however, for the near-term, the M16 rifle should be retained as the standard combat rifle. All services except the Navy concurred in the findings of the study. The Navy considers it essential to develop a new rifle within the next 5 to 6 years. The study was forwarded to the Office of the Secretary of Defense on 18 March 1981.

The Joint Service Small Arms Program was chartered in December 1978 to harmonize the design, development, test, evaluation, and introduction into the services of small arms. Additionally, the JSSAP has been involved in coordinating service requirements for small arms. Thus far, the JSSAP has done an outstanding job of coordinating the efforts of all the military services in the small arms arena. The handgun and M16 rifle studies are two tangible products of this group's efforts, but the intangible results are probably more significant. For the first time ever, the services have consolidated their small arms technology efforts in reducing the waste and inefficiency associated with fragmented, duplicative individual service work. We now have a fully coordinated joint program that focuses on development of small arms technology that will eventually materialize in better small arms for all military services. I'm convinced that in a few years we will see significant increases in our capability in this area.

FY 82 Army Procurement & R&D

Senator D'Amato: The World Wide Military Command and Control System (WWMCCS) has suffered some well-publicized problems. The system's hardware is old. Are actions underway to procure modern computers for the system? Will system architecture be improved? Is the investment in the present hardware inhibiting basic changes to upgrade the system?

Answer. Actions are underway to procure modern computers. Modifications to the WWMCCS ADP system and WWMCCS Intercomputer Network (WIN) are being planned as part of the WWMCCS Information System (WIS) Modernization program. Replacements for the WIN communications network computers will be acquired and installed in FY 81 and FY 82. A Network Front End (NFE) computer which will provide more flexible and reliable terminal service for WWMCCS users is under development and is planned for delivery in FY 83.

The WIS Modernization Report (19 January 1981) which was submitted to the House Appropriations Committee with the FY 82 budget proposes an improved WIS architecture. This new architecture will provide better user interfaces, improved database management, a local network for flexible connectivity of terminals and computers, and improved security control.

Investment in the present hardware is not inhibiting basic changes to upgrade the system. The improved architecture does reflect a basic change and will permit present hardware to be either enhanced, upgraded, or replaced, as appropriate. An interim modernization of both computers and the software operating system is also under serious consideration.

Senator D'Amato: The Army has future plans to build the German 120mm smoothbore tank main gun in the United States for use on the M1 tank. Where will the gun be produced? If it is produced at Watervliet Arsenal, what impact will it have on employment there?

General Keith. The 120mm tank main gun (gun tube and breech) will be produced at Watervliet Arsenal. Watervliet Arsenal is currently producing, at a low rate, 120mm tank guns for use in the system integration and 120mm ammunition development work for the M1 tank program. The Arsenal also produces the 105mm tank gun, which is currently being installed in both the M60 and the M1 tanks now being manufactured. About 32% of the Arsenal workforce is involved in tank gun manufacturing. This figure will remain constant as current 105mm tank gun production decreases and 120mm tank gun production increases to support the production of the 120mm gun equipped M1 Abrams tank in the mid-1980's. The Army will make the final decision on accepting the 120mm tank gun system for installation in the M1 tank following the review of the developmental and operational testing results of the 120mm tank gun system in June 1983.

Ammunition Material Handling Equipment

Senator D'Amato. What plans are there to upgrade materials handling equipment destined for ammunition handling units? Will rough terrain forklifts be provided to Reserve Component units with ammunition supply responsibilities? When?

General Keith. Within TOA constraints the Army will be procuring required material handling equipment that will be distributed to ammunition handling units. A portion of the FY82 budget procurement request for material handling equipment is to make up the shortfall of material handling equipment in the Reserves/National Guard. This will be continued thru the FYDP.

Senator D'Amato: What is the Army's view on the centralized acquisition management of electronic data processing equipment? Would the Army see any gains in combat readiness from a decentralized approach which allowed it to buy such equipment according to its independent assessment of its needs and priorities?

General Keith. **Centralization under GSA via implementation of PL 89-306 imposes an additional set of procurement rules, procedures, and definitions on an already complex system. The additional reviews and special management arrangements that may occur to insure that these unique GSA requirements are met require added time and personnel resources. Acquisition of systems is affected by the impractical requirement to sever ADP element procurement from the remainder of the system. This severence means that systems may have to be bought in pieces rather than as a whole. This can be expensive. Because each acquisition must be considered separately under GSA rules, standardization can be difficult.**

The need for standardization of ADPE is much greater in the military than it is in other governmental agencies. We cannot rely on contractors to operate or maintain equipment on the battlefield; we must use military personnel. To do this economically, one goal is to have standard families of equipment. The need for standardization within our forces is of particular importance to the Army in order to increase survivability, to reduce the different types of spare parts needed, to be able to exchange materiel for back-up purposes when battle damage occurs, to simplify training of operator and maintenance personnel, and to enhance interoperability between systems. Many of these actions reduce overall costs by not duplicating logistics functions between systems.

Complete standardization means that the supporting non-unit equipment be at least compatible with the equipment provided to units. GSA policies and procedures do not facilitate this kind or level of standardization. GSA emphasizes competition for each acquisition; this principle is not always compatible with the necessity for standardization in the military.

Combat readiness is improved if supportable, up-to-date weapons and support systems are placed in the hands of combat units to meet known threats. Streamlining acquisition procedures for ADP equipment directly assists readiness by increasing the tempo of the acquisition process and avoiding unnecessary delays. The Army is in the best position to assess its needs and establish priorities for these systems and favors decentralized acquisition management of electronic data processing equipment to reduce the layers of management which generate separate approval and review processes. The principle of competition must not be ignored wherein lowest overall costs are the objective; however, competition for the sake of competition must be avoided. When necessary, provisions must exist to permit risk and technology to supersede cost considerations.

Senator D'Amato: There are plans to activate a number of Combat Electronic Warfare Intelligence Battalions in the Reserve Components. What measures are being taken to provide those units with up-to-date equipment compatible with Active Army equipment and capable of coping with the threat?

General Keith: Our Combat Electronic Warfare and Intelligence (CEWI) units will be formed by reorganizing older Military Intelligence and Army Security Agency units. Historically, we have not been able to provide these units with much in the way of equipment. However, as we apply the CEWI concepts and undergo a rather extensive equipment modernization program in our active component units, we are determined to apply the total force concept and eventually make some substantial improvements in our reserve component units as well. This is going to take time and money. The Army's acquisition objectives for electronic warfare modernization systems include sufficient quantities to fully meet all reserve component requirements. However, we project that it will be several years before procurement funding and production schedules enable delivery of new systems to the reserves. In the interim, we have several initiatives to alleviate this problem. For example, we are considering the reconditioning of older, serviceable equipment being replaced in the active component and issuing it to reserve units. We are also looking at relatively inexpensive off-shelf electronics equipment which can provide a limited operational capability and will be extremely useful for training purposes.

The total Army National Guard wartime shortages and shortages in New York Army National Guard units are as follows:

		ARNG Shortage	NY Shortage
a.	TOW Cobra Attack Helicopter	371	21
b.	Observation Helicopter	371	47
c.	Tactical Automatic Data Processing System	136	6
d.	Tanks	725	22
e.	5-Ton Trucks	986	75
f.	8-Ton Trucks	1,223	25
g.	20-Ton Trucks	751	12
h.	155mm Towed Howitzers	86	36
i.	155mm Self-Propelled Howitzers	396	0
j.	8-Inch Self-Propelled Howitzers	88	7
k.	AN/MPQ-4 Counter-Battery Radar	7	2
l.	AN/PPS-5 Ground Surveillance Radars	126	4
m.	AN/TPS-25 Surveillance Radars	10	1
n.	Chapparal Missile System	192	0
o.	Vulcan Gun System	192	0
p.	81mm Mortar Carriers	145	6
q.	4.2-Inch Mortar Carriers	107	0
r.	Cargo Carriers	162	0
s.	Command Post Carriers	289	7
t.	TOW Carriers	558	18
u.	Armored Personnel Carriers	2,313	93
v.	Communications Equipment *	$ 594M	$35M

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*Due to various types of items, this shortage is expressed in dollars.

Reserve Component units, to include those in New York, are provided equipment in accordance with their DAMPL priority, which equates to the units' relative positions on the deployment schedule. Reserve Component roundout units are assigned the same priority as their Active Component sponsor, thereby assuring equipment will be available for early deployment. The balance of the Reserve Components are also assigned priorities and issued equipment in line with their criticality in the planning of national defense.

In the case of New York, 10 of 66 units reported a readiness condition of 70 percent or better (C-3) for equipment on-hand and [illegible] of 66 reflected C-3 or better for equipment readiness on their last unit status report dated 15 Jan 81. NYARNG was provided $2,161,100 in FY 81 for procurement of stock fund equipment. The NGB identified $181,000 of this amount for purchase of chemical defense equipment to insure units receive this type of equipment for enhancement of training in a chemical environment and improvement of combat readiness. Additional major items of equipment, e.g., AN/TRC-138 radio terminals, RATT AN/GRC-122's, RATT AN/GRC-142's, M88A1 Recovery Vehicles, and other items to improve readiness are currently programed for issue to NYARNG units during FY 81.

Senator D'Amato. The Army has tens of thousands of items of Test, Measurement and Diagnostic Equipment (TMDE) which require regular calibration and occasional repair. What impact on the Army's calibration requirements will introduction of the following new systems have: (1) M-1 tank; (2) M60A3 tank; (3) IFV/CFV family of vehicles; (4) Patriot air defense system; (5) UH-60A; (7) AH-64; (8) SOTAS; (9) MLRS; (10) Pershing II; (11) DIVADS; and (12) RPV's?

General Keith. The new family of Weapon Systems now or about to be fielded have incorporated into their maintenance scheme Built-in-Test Equipment (BITE). This capability can recognize and fault isolate problems both in calibration and TMDE. With this capability it is anticipated that the frequency and level of calibration can be reduced.

Senator D'Amato: How does the Army's current purchase of manual calibration equipment, the AN/GSM-286 and the AN/GSM-287 TMDE Calibration and Repair Sets, address the sophisticated needs of the large number of very complex systems coming into the Army inventory in quantity in the course of the next decade?

General Keith: The AN/GSM-286 and AN/GSM-287 mobile vans consist of commercial off-the-shelf manual test equipment that is of the most recent technology. These vans are designed for maximum flexibility to meet changing support requirements and introduction of new and sophisticated equipment. As an example of staying current with present needs, the Army recently purchased nine automatic meter calibrators and controllers and will place these sets with the mobile vans in Europe and further enhance the capability to support new and emerging weapons systems.

Senator D'Amato. There are reports that, when spot-checked, only approximately 64% of the Army's TMDE meets established calibration standards. Since inaccurate TMDE affects everything from the ignition timing on staff cars to the accuracy of weapons guidance systems, there is a clear need to focus attention in this area. What percent of the Army's TMDE does meet calibration standards?

General Keith. The Army's calibration quality level has been maintained at a constant level of 81-85 percent (that is 85 percent of all TMDE presented for calibration will be in-tolerance, 15 percent out of tolerance). The 64 percent level applies to combined calibration and repair requirements for White Sands Missile Range's (WSMR) TMDE. When repair requirements are extracted the level approaches 80 percent.

Senator D'Amato. How do the Army's standards for calibration of TMDE compare in frequency of scheduled calibration and required accuracy with private industry standards for the same or similar kinds of equipment?

General Keith. The Army's frequency and accuracy levels compares quite well with that of industry. The Army's calibration quality level is 81, while the level industry works to is 85. However, industry does make more use of limited calibration (calibrating to fewer functions and ranges) and expansion of the calibration tolerance bands than do the Services.

Senator D'Amato. What rank and MOS are the personnel who will operate the AN/GSM-286? The AN/GSM-287?

General Keith. The following is the rank and MOS of personnel who operate the mobile calibration units.

AN/GSM-286 1 Van No Microwave Capability

Position	Rank	MOS
Team Chief	Sergeant First Class (E-7)	35H
Calibration Specialist	Staff Sergeant (E-6)	35H
Calibration Specialist	Sergeant (E-5)	35H
Calibration Specialist	Specialist (E-4)	35H
Calibration Specialist	Private First Class (E-3)	35H

AN/GSM-287 2 Vans Microwave Capability

Position	Rank	MOS
Team Chief	Sergeant First Class (E-7)	35H
Calibration Specialist	Staff Sergeant (E-6)	35H
Calibration Specialist	Sergeant (E-5) (2)	35H
Calibration Specialist	Specialist (E-4) (2)	35H
Calibration Specialist	Private First Class (E-3)	35H

Senator D'Amato. The Army justifies its purchase of the AN/GSM-286 and AN/GSM-287 Calibration and Repair Sets in part on the basis of its need for decentralized TMDE calibration and repair capability in wartime. Has the Army evaluated the cost effectiveness of procuring a smaller number of more efficient automated calibration systems and using them in somewhat more centralized locations?

General Keith. The Army doctrine for TMDE support is for mobile support delivered to the lowest practical level to include attachment of mobile teams to each division. The lack of high density workload at most locations in the field Army, particularly of like items makes it not cost-effective to be utilized in a centralized concept. The Army, to meet valid European requirements, is introducing automatic meter calibration and controller equipment into the theatre. This equipment will be aboard the mobile vans.

Senator D'Amato. Mr. Loebe Julie, owner of Julie Research Laboratories, Inc., of 211 West 61st Street, New York, NY 10023, is an engineer and a New York small businessman who tried to interest the Army in automated calibration equipment in response to an Army Request for Proposal in 1974. He alleges that he submitted the low bid in response to the RFP. He further alleges that his bid was erroneously deemed late, and rejected, requiring his direct personal intervention to accomplish correction of the error and acceptance of the bid for evaluation. He further alleges that the

Army contracting officer then determined his bid "technically unacceptable", on the basis that his equipment could not do what he claimed it could do, without making any attempt to evaluate the actual performance of the Julie Research Labs equipment in question. The John Fluke bid was declared the winner, even though it was the second highest of four bids submitted. Mr. Julie alleges he then lodged a formal protest with the General Accounting Office, which failed to evaluate the technical merits of his equipment, and supported the Army's decision not to procure his equipment on the basis that the Army had followed approved procedures in processing the procurement. Are Mr. Julie's allegations substantially accurate?

General Keith. Mr. Julie's contention that the bid was initially declared late and then reinstated is correct. When the Julie proposal was received it was time stamped in Greenwich Mean Time (Code name ZULU), however the letter "Z" was not shown and it was mistakenly thought to be local time. To the allegations that the Army contracting officer determined his bid "technically unacceptable" on the basis that his equipment could not do what he (Julie) claimed it could do, the Army clearly understood what Mr. Julie had to offer. Mr. Julie was non-responsive to the requirements of the Request For Proposal (RFP). The evaluation was conducted by a competent engineering and scientific staff and reviewed by the Army Meterology and Calibration Center (AMCC) engineering personnel. All of the Julie allegations and the AMCC responses were reviewed by the General Accounting Office and addressed in detail in the Comptroller General's decision B-182288.

Senator D'Amato. Mr. Loebe Julie alleges that the Army has conducted 8 successive procurements under restricted conditions (sole source, or the equivalent) of calibration equipment, and has discriminated against his equipment in a systematic way. He further alleges that the Army has used erroneous data as the basis for rejecting four unsolicited proposals he made to the Army to sell the Army calibration equipment. He made those allegations in writing to the Subcommittee on Investigations of the House Armed Services Committee in a letter dated March 19, 1981. Are Mr. Julie's allegations substantially based on fact.

General Keith. I cannot specifically respond to the eight previous procurements that Mr. Julie alleged took place under restricted conditions. Two recent contracts were awarded through the General Services Administration catalogue (sole source) for automatic meter calibration and controller equipment and current procurement practices were followed in awarding this contract. The general policy is to procure competitively whenever possible. The allegation that the Army used erroneous data as the basis for rejecting four unsolicited proposals is misleading. Mr. Julie submitted unsolicited proposals in 1976 and 1979 and both were considered not acceptable. Evaluation was based on price data submitted by Mr. Julie. Also, Mr. Julie's proposal did not meet the operational requirement as defined by the Army. There is no operational way to use the quantity (69), as proposed by Mr. Julie, to cover the mission of 200 manual calibration sets. The Army's concept for calibration support is de-centralization, structured to meet wartime requirements.

QUESTIONS SUBMITTED BY SENATOR STENNIS

Senator Stennis: I would be interested in having you compare the Air Force PAVE MOVER radar program with the SOTAS - the Blackhawk Helicopter Standoff Target Acquisition System. Are they both candidates for the same mission?

General Keith: The SOTAS and PAVE MOVER programs differ in mission and in maturity.

SOTAS is being developed to provide the critically-needed capability for the division commander to detect, locate and track moving targets out to (Deleted). During a mission, the system will provide a continuous, near-real time video display of moving targets in the division sector to ground stations located with each brigade headquarters, the division headquarters and forward command post, and the division artillery headquarters. PAVE MOVER is being developed by DARPA and the Air Force as a theater-level asset to provide closed-loop moving target acquisition and command guidance for certain surface- and air-launched missiles under the ASSAULT BREAKER concept.

SOTAS is in full-scale engineering development with completely defined technical scope and organizational, operational, and logistical concepts. PAVE MOVER is just entering technology demonstrations with brass board hardware to determine whether the proposed target sensing and command guidance approach is feasible. Operational employment concepts and the supporting organizational, hardware and logistic concepts have yet to be developed.

The SOTAS and PAVE MOVER are being designed for different missions to be performed at different echelons of command. Their radar technology is similar and there has been excellent cooperation between radar developers of the SOTAS Program Office and those of the PAVE MOVER. The SOTAS radar and processing system can be modified to perform the long range target acquisition and closed loop guidance functions of the PAVE MOVER and, since the SOTAS radar is more mature, the Army would like to have it considered as an alternative to the PAVE MOVER radar.

Senator Stennis: Some observers feel the Army is reluctant to accept the PAVE MOVER program because it isn't being developed by the Army. Would you comment on this?

General Keith: Any concerns the Army has regarding PAVE MOVER are unrelated to who develops it. The Army has actively pursued methods for receiving, processing, and exploiting data collected by Air Force sensors and has developed, or is developing, interfaces with USAF Senior Ruby, Senior Spear, Rivet Joint TEREC and Advanced Synthetic Aperture Radar systems. The Army and Air Force are also working together in the Joint Tactical Fusion program to improve data interchange.

Our concerns regarding PAVE MOVER are based on genuine question regarding the ability of a system designed and developed as a Theater asset, and controlled at Theater or Army Group/Tactical Air Force level, to provide the immediate and responsive battlefield management and target acquisition support to Division and Brigade Commander. These Commanders must fight the land battle and they must have the information necessary to concentrate their combat power at the critical time and place. The information must be accurate and timely enough to support targeting and maneuver decisions. The system providing the information must be flexible and responsive to the dynamics of the battle, and to the Commander fighting the battle. That Commander must be able to shift its emphasis, relocate it, and have it on station providing the needed information as the situation dictates.

SOTAS, as a system designed to operate within the Division with multiple ground stations, provides this capability. The Army does not believe that a system designed primarily for long range target acquisition and closed loop strike control at the Army Group/Tactical Air Force or Theater level can provide this capability.

Senator Stennis: Isn't one of the problems with SOTAS the fact that it must fly very close to the battle area and is, therefore, vulnerable and also can't fly high enough to see deeply into enemy territory or detect non-moving targets?

General Keith: This is not a problem. The mission flight profile, the airframe and its ASE suite, and the radar accuracy, range resolution, and detection probability have been carefully integrated to optimize satisfaction of the division commander's battle management and target acquisition requirements while minimizing the system's vulnerability to the Air Defense and Electronic Warfare threat.

The radar-equipped helicopter will fly approximately [redacted] behind the FLOT, and at an orbit point and altitude chosen to minimize radar masking along critical avenues of approach and exposure to enemy air defenses.

(Deleted)

The radar is designed to detect moving targets. Studies indicate that it is technically feasible to

(Deleted)

but the Army is concentrating on moving target indication because it is the movers that constitute the immediate threat and that the division commander must detect, track and target in order to fight his battle.

The radar's designed range is based on the division Commander's requirement to see moving targets (Deleted) and while operating at a [redacted] standoff as described above.

Senator Stennis. The Army has been working on improving an existing helicopter to perform the scout role in support of the attack helicopter mission. The candidates are the OH-58 and the OH-6. Critics claim that both of these candidates are underpowered and lack agility and night vision capability to be compatible with the attack helicopter. What are your thoughts about this and other candidates available?

General Keith. The Army Helicopter Improvement Program (AHIP) addresses the issues you raised in your question. The AHIP is a modification of an existing airframe because the Army recognized that a new airframe development program is unaffordable vis a vis ASH which appeared in previous Army budget request. The type of mods we are contemplating in AHIP are those that will improve the hot day hovering capability and provide target acquisition sensors that will interact with the attack helicopter, given the capacity of the candidate airframes namely the OH-58 and OH-6. The mast mounted sight package to be applied to the AHIP system will be a vast improvement to the present scouting capability which is an observer riding in an OH-58C with a pair of binoculars. The mast mounted sight will have a TV, laser designator, and a Forward Looking

Infrared for night operation. The crew will use the improved night vision goggles and therefore enable the AHIP to operate at night.

The AHIP is a realistic approach toward acquiring a credible scouting capability and holding the line on cost.

Senator Stennis. What amount is in the Fiscal Year 82 budget for improvements to these existing aircraft?

General Keith. The Fiscal Year 1982 RDT&E funding request for AHIP is $38.6 million.

Senator Stennis. The Army is developing two versions of the HELLFIRE missile -- a laser terminal homing guidance and an infrared guidance. Would you describe these guidance systems and where the Army stands on each?

General Keith. The semi-active laser HELLFIRE employs a seeker which guides on laser energy reflected from the target. The target can be designated with laser energy by ground or airborne designators. The launch platform, the Advanced Attack Helicopter (AAH), must remain on station until target impact when operating in the autonomous designation mode but may take evasive action (launch and leave) after the missile is fired when operating with a remote designator. In either case, the target must be designated until target impact.

The laser HELLFIRE is nearing completion of a very successful engineering development program. The Fiscal Year 82 budget request of $130.1 million is for procurement of 1075 missiles.

The HELLFIRE missile with an infrared seeker is a fire-and-forget, lock-on before launch, direct fire antitank missile concept. An infrared imaging sensor is mounted on a two-axis stabilized platform in the nose of the seeker. The sensor provides a thermal image (video) of the sensor's field of view for target tracking and display before launch, if selected by the gunner. The AAH Target Acquisition and Designation Sight (TADS) is used to acquire the target. An automatic target handoff correlator is used to compare the TADS video with the seeker video, to measure the boresight error between the two scenes, and to provide electrical signals to drive the gimbals of the seeker sensor to cause it to be aligned with the TADS sensor. When launched, the missile flies a slightly lofted trajectory to the target, directed by commands derived from the auto tracker used in the seeker. The AAH is free to remask or engage other targets immediately after missile launch.

The Army has terminated efforts to initiate engineering development of this concept due to the projected small increase in weapon system effectiveness compared to the estimated dollar investment. Instead, the Army is pursuing an advanced development program to develop the best possible weapon system option to complement laser HELLFIRE on the AAH. Technology options include infrared and millimeter wave seekers and hypervelocity missiles.

Senator Stennis. The production decision for the AAH -- the Attack Helicopter -- is scheduled for December, 1981. This is very tight in view of the flight handling problems that have surfaced in recent testing as well as the increased weight that degrades the operational characteristics of the aircraft. Is it your opinion that these problems can be solved prior to the production decision date?

General Keith. In April 1979, the Advanced Attack Helicopter (AAH) was tested by the Army and was found to have some flight handling problems. The tail section of the helicopter was redesigned by incorporating a movable stabilator instead of the fixed T-tail stabilizer and modifying the tail rotor. These design changes have been extensively tested to include two Army series of flight tests in November 1980 through January 1981. The results of these tests verify that the design changes have corrected the flight handling problems, and the AAH has demonstrated its full aerodynamic flight envelope.

In response to the weight of the AAH, it is correct that the developmental prototypes weigh too much. However, the Army had identified a weight reduction program that could result in a production aircraft that would achieve the minimum vertical-rate-of-climb requirement. In February 1981, the Army made a decision to incorporate the General Electric T700-GE-701 engine in the production AAH to achieve increased performance, mission capability and flexibility, enhanced survivability, and better reliability. The Army will continue to pursue weight reduction but will now consider the cost and benefit trades in relation to the capability of this more powerful engine. The current estimated primary mission gross weight, with the -701 installed, is 14,510 pounds. This will allow the AAH to exceed the vertical rate-of-climb requirement by 100 percent at primary mission gross weight or to achieve an increase in useful load of approximately 700 pounds while maintaining a vertical rate-of-climb of 450 feet-per-minute at 4000 feet, 95° Fahrenheit.

Senator Stennis. Do you believe that an improved engine will have to be developed to provide for improvements in vertical rate of climb and speed requirements?

General Keith. On 6 June 1980, the Army notified Congress of our plans to begin a qualification program for a T-700-GE-701 engine for potential use on the Advanced Attack Helicopter (AAH). This engine is a derivative of the production T-700-GE-700 engine on the BLACK HAWK helicopter and incorporates some improved design features from the T-700-GE-401 engine for the LAMPS helicopter. The Navy test program for the LAMPS engine has reached sufficient maturity, with no evident technical problems in the design features applicable to the -701, that the Army has determined that it is appropriate to use the -701 engine for the first AAH production buy in fiscal year 1982 and advised Congress of this decision in a letter dated 27 February 1981.

While the production AAH with -700 engines could be expected to meet its performance requirements, the new engine represents significant and cost-effective improvements in mission capability and flexibility. As mentioned before, in high altitude and hot day conditions, there will be an increase of approximately 700 pounds in the useful load capacity while maintaining a vertical rate of climb (VROC) capability of 450 feet per minute. This is the equivalent of being able to carry 14 instead of 8 HELLFIRE missiles in a Middle East environment. Conversely, the AAH VROC can be increased by 100 percent while carrying 8 missiles, 320 rounds of 30 millimeter ammunition, and fuel for 1.83 hours. The production AAH will also be able to achieve 146 knots in cruise speed with the -701 engine. In the case of total power loss from one engine, at a hover out of ground effect in nap-of-the-earth flight, the AAH with the -700 can be flown in a controlled descent to an immediate landing. The -701 provides the capability to hover and transition to forward flight for a landing at a preferred site. An additional bonus is that the -701 will achieve an increased measure of reliability compared to the -700 because of fewer parts and reduced operating speeds and temperatures.

The procurement funds to provide these manifold enhancements for 536 AAH's are $58 million above the cost of equipping the fleet with the -700 engine, or an increase of 6 percent in the cost of engines spread over the procurement period. The operating and support cost increase for a twenty-year period is estimated to be less than 1 percent greater for the -701. However, it can be anticipated that this O&S cost could become less when it is considered that the increased payload reduces the number of sorties to engage a specific number of tanks and that the AAH will have a significant improvement in survivability.

The Army program for -701 qualification is on schedule with two prototype engines and has low technical and schedule risk to meet the AAH production requirements.

VIPER

Senator Stennis. What is the status of the VIPER program? It appears the program has been experiencing technical problems during development as well as substantial cost growth. Have these problems been resolved, and are we now close to a production decision?

General Keith. The VIPER Operational Test was halted at Fort Benning when a round suffered a launch tube rupture. The contractor (General Dynamics) has identified the problem as a combination of external and internal damage to the launch tube. A fiberglass overwrap is being applied to the rear portion of the launch tube on remaining test rounds and will become a part of the production process.

At the last In Process Review (IPR) three technical problems remained to be solved. Those were: 1) excessive warhead duds, 2) firing mechanism separating from the launch tube at cold (-40°F) temperature, 3) launch tube leaking water after 2 hours submersion in water. The contractor is actively working to solve these problems at the present time.

Current plans are the Operational Test to be restarted in early May. The production decision IPR will be scheduled for late June 1981.

Senator Stennis. What about the German-developed ARMBRUST? This is a similar weapon system that appears to have substantial capabilities. Have you plans to test this weapon?

General Keith. The ARMBRUST weapon is a commercial venture by the Messerschmitt-Bolkow-Blohm (MBB) Company of West Germany. The Army test fired the weapon at Ft Benning in 1975 and firing demonstrations were held at Ft Lewis and Ft Bragg on Sep 21st and 25th 1979 respectively. Additionally, the ARMBRUST has been evaluated by the Army as an antitank and urban warfare weapon. The current ARMBRUST does not meet the Army's approved requirements for either role. The ARMBRUST is much heavier than the VIPER and its armor penetration is not an improvement over the current Light Antitank Weapon (LAW).

MBB has submitted an unsolicited proposal to the Army outlining a program to increase warhead size and penetration. This program has not begun, and would only begin with a commitment for procurement from the US and would involve procurement of a negotiated quantity of the current system. That proposal is currently being evaluated by the Development and Readiness Command (DARCOM).

As the Army continues to evaluate weapon requirements for the close-in battle, an improved ARMBRUST may be evaluated to meet those requirements.

Senator Stennis. The Fiscal Year 1981 appropriation included $13 million for procurement of the Light Antitank Weapon (LAW) from Norway to assist in Army training efforts pending the availability of VIPER. Will the rounds procured with FY1981 funds be adequate until VIPER training rounds are available?

General Keith. With the recent delays in the VIPER program, those LAW's procured in FY1981 will not meet the total training need. However, it will help to partially offset current shortfalls in LAW training.

Senator Stennis. How is the testing progressing on the light armored tanks? There is funding in the fiscal year 1981 appropriation for this purpose.

Answer. The Army is not currently testing light armored tanks per se. The Army and Marine Corps are conducting a joint Armored Combat Vehicle Test (ACVT) Program. That program is using two test bed vehicles (not tank prototypes) each equipped with a 75 millimeter cannon. The ongoing tests represent a quest for technology which may be used in the development of future lightweight armored combat vehicles. Both test bed vehicles are currently at Ft. Knox, Kentucky where testing is progressing very well and is scheduled for completion in August 1981.

Senator Stennis. What is the Army looking for in capability from these tanks? Are you looking for the capability to attack a Soviet T-72 tank or something with less heavy armament than this?

Answer. The Army desires to initiate a far term developmental program to produce a lightweight, strategically deployable, tactically mobile, armored combat vehicle for its light divisions. Ideally the Army would want a lightweight armored system with a gun capable of defeating the Soviet T-72 tank. However, we realize that a lightweight system cannot slug it out with heavier Soviet armor. Therefore our expectation is to develop a lightweight armored system that can definitely defeat lightweight armor while also giving us some degree of defeat capability against heavier threat armors.

Senator Stennis. Is the Army working with the Marines on a possible joint program for procurement of this type tank? The requirements would appear to be similar.

Answer. Yes, the Army is working with the Marine Corps. For the far term requirement, the Army and Marine Corps have convened a Joint Working Group to determine the basis and potential for a joint Army/Marine Corps Program. This working group will evaluate the results of the ongoing Armored Combat Vehicle Technology Program, the Advanced Antiarmor Evaluation, and the Field Analysis Concept Tests in light of the threat to determine the best system suited to meet the needs of both services.

Senator Stennis. Is it possible that a candidate vehicle will be selected from the Mobile Protected Weapon System (MPWS) project?

Answer. At this point it would be highly premature to state the possibility of a candidate vehicle being selected from the Mobile Protected Weapon System project. First there is no definition as to what the candidate vehicles or systems may be. Secondly the Joint Working Group should be allowed to evaluate available data that will help determine requirements and the availability of technology to meet those requirements.

BATTERY COMPUTER SYSTEM

Senator Stennis. Initial operational tests on the Army Battery Computer System in 1979 showed a number of deficiencies. More recent tests have been conducted at Fort Sill, Oklahoma. Have we any results from the most recent tests?

Answer: Additional tests on the Battery Computer System were conducted at Fort Sill, OK during September 1980. As a result of the Development Acceptance In Process Review held in July 1979, the scope of these tests were limited to correcting software and built-in test equipment deficiencies found during Development/Operational Test II

(DT/OT II). Of the 537 software deficiencies found in DT/OT II, 87 were subsequently found to be duplications of other problems or were not deficiencies. The correction of 49 deficiencies was deferred by the US Army Training and Doctrine Command because planned changes to the production model hardware and software would result in additional changes to these areas. The remaining 401 deficiencies were required to be fixed by the contractor.

As a result of testing the contractor corrections to those deficiencies, only three technically minor problems remained. Fifteen new problems were discovered. The contractor has corrected all eighteen outstanding problems. The Government will test these corrections during the First Article Tests scheduled to begin in August 1981.

The built-in test equipment test included a retest of the 40 faults that were not correctly detected or isolated in DT/OT II, plus a sampling of 15 of the 130 correctly detected and isolated faults from DT/OT II, plus 5 new faults. As a result of the combined test results from DT/OT II and the retest, the built-in test equipment meets contract specifications.

Subsequent to the Fort Sill tests, the Army retested the other 115 correctly detected and isolated faults from DT/OT II. All 115 were again correctly detected and isolated in the retest. The built-in test equipment will be further tested in an operational environment during the Follow-On Evaluation scheduled to begin in February 1982.

BATTERY COMPUTER SYSTEM

Senator Stennis. Has the Secretary of Defense certified that the deficiencies noted during the 1979 tests have been corrected?

Answer: The Secretary of Defense could not and did not certify that the deficiencies noted during the 1979 tests had been corrected. In his letter dated December 20, 1980 to the Chairman of the Senate Appropriations Subcommittee on Defense, he concluded, "Although the BCS has not demonstrated in testing that all specifications for performance and reliability have been met, the Army has substantially corrected and tested the software and built-in test equipment deficiencies, and identified the remaining hardware corrections. I conclude, therefore, that the BCS program is proceeding satisfactorily, and that production is now appropriate. I have authorized the Army to proceed with the second year of production."

High Technology Test Bed

Senator Stennis. Please explain the High Technology Test Bed program which is being conducted by the 9th Infantry Division.

General Keith: The High Technology Test Bed Program is directed towards developing an Infantry Division designed to facilitate rapid deployment and meet the requirement for Light, hard-hitting forces. The purpose of the High Technology Test Bed is to provide through field tests an evaluation of operational, organizational, doctrinal, and technological opportunities for enhancing overall combat capability of our light division while concurrently improving strategic deployability. It will be capable of performing contingency missions but still have utility on the European battlefield. The 9th ID is transitioning from its current base to that of a modern high technology division. Testing will begin in May 81. The results will be applied to other infantry divisions.

Senator Stennis. The Assault Breaker program is designed to attack moving rear echelon armor with standoff weapons. The Army appears to prefer a ground launched missile and the Air Force prefers air launched. This system is proposed to be fielded at the same time as the Corps Support Weapon System, the Multiple Launch Rocket System and the Air Force WASP minimissile. What is Assault Breaker supposed to do that cannot be accomplished by the other systems?

General Keith. The Army does not plan on fielding an Assault Breaker weapon system separately from the CSWS. The Army and Air Force have been participating in the DARPA Assault Breaker technology demonstrations of potential long range antiarmor capabilities since 1978. Flight tests of "brass-board" Army surface to surface carrier missiles and an Air Force advanced development radar system to locate targets and provide carrier missile midcourse guidance will be conducted at White Sands Missile Range in FY 81/82. Follow on DARPA/Air Force demonstration involving Air Force Pave Mover, penetrating aircraft and air to surface carrier missiles will be conducted in FY 82. In both demonstrations the carrier missiles will dispense submissiles with infrared terminal homing and nonhoming target sensing munitions. The Army is evaluating the integration of the cost effective elements of the Assault Breaker technologies, LANCE nuclear and antipersonnel/antimateriel replacement requirements, and chemical warhead considerations together into a total CSWS program. A Special Task Force (STF) headed by a General Officer convened 9 March 1981 to prepare a concept formulation package, cost/performance analyses, requests for proposals, and other documentation leading to a CSWS development decision in FY 82. Additionally, Assault Breaker technology may have application to other programs such as the Multiple Launch Rocket System Terminal Guidance Warhead.

Senator Stennis. Will this system cause problems where the Air Force will operate the target acquisition system and the Army the strike weapon?

General Keith. No, although close coordination between Service programs will be required to ensure necessary system and operational interface is achieved.

OSD has centralized the management of Assault Breaker and the Services' exploitation of the demonstrated technology in the Office of Tactical Warfare Programs, USDR&E.

Senator Stennis. How do you view the new technologies involved in the Assault Breaker System? Would you say they include medium to high risk of success?

General Keith. The Assault Breaker technology demonstration will conclude with many questions remaining to be answered regarding command, control, communications, countermeasures and submunition warhead effectiveness. The Army is considering the integration of an antiarmor capability, based on the cost effective elements of the Assault Breaker technology demonstration, into Corps Support Weapon System (CSWS). Additionally, Assault Breaker technology may have application to other programs such as the Multiple Launch Rocket System Terminal Guidance Warhead. The Army does not plan on fielding an Assault Breaker Weapon System separately from the CSWS.

Yes, the Assault Breaker technologies are generally considered to be of medium to high risk.

M1 TANK

Senator Stennis: The M1 tank is falling about 10% short of meeting the stated requirement of operating 275-325 miles without refueling. This could have a significant impact on the Army's battlefield logistical support structure. What are your plans for supporting the additional fuel carrying requirement?

General Keith: Because the M1 consumes about 50% more fuel than the M60 for the mission profile, it will be necessary to add to each M1 tank battalion a capacity to haul an additional 10,800 gallons and an additional 5,000 gallons to the division's support command for each tank battalion. The major equipment increases per tank battalion are indicated below. This will provide sufficient fuel in the tank battalion for 48 hours of operation.

EQUIPMENT	QTY
Truck, cargo, 5 ton	6
Truck, tractor, Semi, 5 ton	1
Trailer, petroleum, 5000 gal	1
Trailer, cargo 1&½ ton	6
Tank and pump unit	6
600 gal pod	6
TOTAL	26

M1 ABRAMS TANK

Senator Stennis. Delivery of engines and thermal sights for the M1 tank have been delivered behind schedule. A number of tanks have had to be stored for lack of these components. What is the current status?

General Keith. At the end of February 1981 the Army had accepted 76 M1 tanks and there were 31 M1's stored for lack of engines. The pacing item has been and remains the AGT 1500 turbine not thermal sights. We do not anticipate the need to store any vehicles for the lack of thermal sights. We also anticipate that our engine manufacturer will continue to improve against our schedule; this belief is further strengthened by the fact that he has met or exceeded the schedule projection in both February and March. The bottom line is our firm belief that we can receive all 569 M1's in the FY 1981 program by the end of the funded delivery period as required.

Senator Stennis: Is work continuing on a backup diesel engine for the M1 tank or are you satisfied that the reliability and durability problems that have plagued the turbine engine have been solved?

General Keith: Yes Sir, work is continuing on the Congressionally directed back-up diesel engine. The Army is satisfied that past reliability and durability problems with the tank's turbine engine have been solved.

VULCAN

Senator Stennis. The GAO suggests that, instead of improving the Vulcan air defense system, the Stinger system should be provided to elements of the Rapid Deployment Force (RDF). Stinger is air transportable and already in production. What do you think of this recommendation?

General Keith. Stinger is to be provided to all of the Army's elements, to include the RDF, just as rapidly as Stinger production allows us to replace our aging REDEYE missiles. Vulcan will remain in our forces, including the RDF, for many years to come. Both systems have useful roles and are needed for balanced air defense. We would like to improve Vulcan but the priority has not been high enough to secure necessary funding.

Senator Stennis. Is it true that opinion as to the advisability of improving VULCAN is divided -- the Headquarters Army staff in favor of improvement and the Training and Doctrine Command and the Materiel Development Command against?

General Keith. There are differences with regard to priorities for funding. However, the Department of Army has made no decision regarding the execution of the PIVADS program pending receipt of the program analysis now being conducted by the Development and Readiness Command. This analysis will be coordinated with Training and Doctrine Command prior to submission to Department of the Army.

Senator Stennis. The fiscal year 1981 Defense Appropriation Act included $9.6 M for additional testing of the Product Improved VULCAN air defense system (PIVADS). How is the testing coming to date on this improvement?

General Keith. The Army has not committed the $9.6 million for PIVAD testing. We have committed $88.6 thousand in order to complete a thorough analysis of the cost, effectiveness, and program strategy of the PIVAD system. We felt it was prudent not to obligate R&D funds when no funds have been budgeted for a follow-on procurement program. Additionally funds should not be expended until the cost-effectiveness/strategy analyses have been completed.

Senator Stennis. It is my understanding that the towed version of VULCAN is scheduled to remain in the inventory for the forseeable future for airborne and air assault divisions of the Rapid Deployment Force. Does this continue to be true?

General Keith. The Army's Air Defense Program Plan 91, an update of last years program plan, keeps the VULCAN in the Airborne and Air Assault Divisions until it is replaced by a lightweight system. The Army is preparing the Mission Element Need Statement for the Lightweight Air Defense System at this time. This system would replace VULCAN in the 1988-1992 time frame.

Senator Stennis. What is the earliest possible time that PIVADS may be fielded?

General Keith. The exact data that we would be able to field the first PIVAD system is now being studied at the Development and Readiness Command as part of their analysis of cost, effectiveness, and program strategy. Initial estimates indicate that a reasonable goal for the first modification to be fielded in mid-1984 provided procurement funds were authorized in FY82.

Senator Stennis. Currently the DIVAD Gun program allows the procurement of guns from foreign manufacturers. Has the Army considered the cost and availability impact to the program should the foreign suppliers be unwilling or unable to supply guns? What is the consequence in event of armed conflict?

General Keith. The Army has carefully examined the potential impact of procuring these guns from foreign suppliers and possible ramifications of their unwillingness or inability to satisfy our requirements. We feel by obtaining the technical data package and transfering the technology we will be able to build the systems ourselves should the need arise. Additionally, there are already in existence licensing agreements and facilities in other NATO countries for the procurement of these systems if the prime source cannot deliver the guns. The prime contractors were given the option to procure the guns offshore or to produce the guns in U.S. facilities. Their decisions to procure offshore has been based on cost effectiveness. We can, anytime in the program, establish a U.S. production capability if we feel it is necessary for security reasons or if it becomes cost effective to do so.

FY 1981 Procurement and R&D

Senator Stennis. Does the Army recognize the fact that 50¢ of every dollar spent with an American contractor comes back to the government in the form of taxes, whereas this is not true in the case of defense expenditures to foreign manufacturers?

Answer. We are aware that more of the funds spent with American Contractors remain in the U.S. economy than those spent with foreign manufacturers. However, this is only one of the many items that we consider when making procurement decisions.

Senator Stennis. Has the Army considered that DIVAD Gun production would mean the addition of several hundred new jobs throughout the United States and procurement of several thousand tons of American-made steel?

General Keith. In the acquisition strategy under which the DIVAD Gun was developed, we have attempted to field the system as soon as possible, while not compromising our requirements. The procurement of offshore guns has helped to shorten the acquisition time. The prime contractors were given the option of procuring the guns offshore or producing the guns in a US production facility. Their analysis of the additional costs involved in establishing a US production facility and the additional time required to begin delivery of systems made the decision to procure offshore guns the most cost effective solution. We are obtaining the licensing agreements and technical data packages which will provide us the capability to establish a US production facility if it becomes cost effective to do so.

Senator Stennis. The United States balance of payments has been negative for some period of time. Has the additional negative impact on our balance of payments been considered in the DIVAD Gun procurement decision?

General Keith. The Army, by pursuing the DIVAD Gun acquisition strategy, has attempted to be as cost effective as possible in procuring the system. One of the key points of our acquisition strategy has been to field a mature system at the earliest opportunity. We allowed each of the prime contractors the option of procuring the Gun offshore if they determined that it was cost effective to do so. Each of the contractors did an in depth analysis of the costs and time delays that would be incurred if a US production facility were established. They have proposed the procurement of system offshore based on this analysis. We will obtain the licensing agreements and technical data packages necessary to produce the systems in the US, should it become cost effective, or if security concerns dictate we do so.

Senator Stennis. Recognizing that a US production base for DIVAD Gun spares is a requirement, has the Army analyzed what additional costs would be required to provide a total US production base for both spares and complete Guns vs buying the Guns offshore and just producing the spares in the US?

General Keith. The Army has examined various cost tradeoffs in the DIVAD Gun program. We have prepared cost estimates for producing this system in the United States. We will not know the cost differentials between these estimates and actual costs until source selection is complete. The contractors have been given the option of procuring the Guns offshore if that was cost effective.

Senator Stennis. General Meyer has been quoted as saying that the Army could produce savings of $8-10 billion over five years if multi-year contracting were allowed. I would like your comments and an indication of how savings of this magnitude would come about.

General Meyer. The dollar figures cited are incorrect. Our projected savings over the next five years if the provisions of HR 745 are passed is $3.688B.

We have identified four systems that could be candidates for multi-year contracting in FY82. These include Blackhawk, Chinook, Copperhead and GLLD. In addition we have reviewed the first 250 line items (systems) in our POM 83, using the guidance provided in the 16 January 1981 DEPSECDEF Memorandum on Multi-year Procurement. As a result of this review we have identified 45 potential candidate systems for the multi-year approach starting sometime in the POM 83 timeframe (FY83 thru FY87). The four candidates identified for FY82 are included in the 45 candidates for POM 83. Some of the candidates are:

Cartridge, 25mm, APDS-T
Cartridge, 25mm, HEIT-T
Fuze, Proximity
Mask, CBR Protective, Multi-purpose
Cartridge, 4.2 inch, Illum with fuze
Cartridge, 25mm, TP-T
Tank, Combat, FT, 105 M-1 ABRAMS
Infantry Fighting Vehicle
Patriot (SAM-D) GSE
Patriot (SAM-D) Missile
DIVAD Gun
Multiple Launch Rocket System (GSE)
Multiple Launch Rocket System Missile
Laser HELLFIRE Missile
TOW Tactical (HEAT) Missile

Senator Stennis: What about the Stand Off Target Acquisition System (SOTAS)? Isn't this being developed to operate from the Black Hawk helicopter and identify moving targets beyond the forward line of battle?

General Keith: The Stand Off Target Acquisition System (SOTAS) is being developed to provide the division commander a timely, responsive capability to detect, track, and locate enemy moving targets up to (Deleted) The radar is a coherent MTI sensor, fully hardened to perform in the severe electronic countermeasures environment which is forecast for (Deleted) Video data from the radar is data-linked to ground stations located at division headquarters, division artillery headquarters, each brigade headquarters and the division forward command post. The ground stations have automated interfaces which permit selected target data to be entered into TACFIRE for engagement by artillery. The advanced development system has demonstrated the potential for targeting LANCE missiles and vectoring close air support aircraft during REFORGER exercises in Europe. The Army regards SOTAS as a candidate sensor for targeting surface-to-surface missiles, and as an alternative sensor to augment Pave Mover at ranges closer to the FLOT.

QUESTIONS SUBMITTED BY SENATOR EAGLETON

M1 Abrams Tank

Senator Eagleton. The January 15, 1981 SAR for the M1 tank depicts a planned program buy of 7058 M-1s at a total cost of $18452.6 million. The average cost of a single tank under this profile is $2.614 million. What was the total projected cost of the program at the time the Army presented its testimony of the FY 1981 Army Budget? What was the total projected cost of the program at the time the Army first approached the Congress for funding to support the development of the M1? What was the average cost of a single tank projected to be in each of the above funding profiles?

General Keith. The report to which you refer is not the SAR but the FY 1982 Presidents Budget Estimate Data Sheet. Since this data sheet excludes program costs identified in the M1 Selected Acquisition Report (SAR), I will answer your question based on SAR data. The total projected cost of the M1 program presented to the Congress in January 1981 was $18,955.2 million. The projected unit acquisition cost of the M1 was $2.681 million for 7058 tanks in then year dollars or $.834 million in FY 1982 constant dollars.

The initial M1 program acquisition cost estimate at the start of tank development was identified in the 30 September 1973 SAR. Based on the planning estimate the expected total program acquisition cost was $3,005.4 million and the unit acquisition cost was $.904 million for 3312 tanks, both in then year dollars. In FY 1972 constant dollars this equates to $.701 million. However, these cost estimates were made prior to negotiated contracts for prototype competiton and excluded funds for unforeseen contingencies.

The M1 cost estimate was updated in the December 1976 SAR based on the Development Estimate which included adjustments for program changes such as selection of the prototype for futher development and greater that anticipated economic escalation. It is this Development estimate based in FY 1972 constant dollars, which is used today to compare M1 current costs against base-year thresholds. Based on the Development estimate the expected total program acquisition cost was $4,779.4 million and the unit acquisition cost was $1.438 million for 3312 tanks, both in then year dollars. In FY 1972 constant dollars this equates to $.720 million.

M1 Abrams Tank

Senator Eagleton. Was 7058 M1s the maximum numbers of tanks the Army proposed to buy under this program? If not what was the maximum envisioned?

General Keith. The orignal production objective in 1972 was 3312 M1s. In 1977 the Army undertook a comprehensive review of its entire tank program. The result was the boosting of the original quantity to 7058. This represents an Initial Operational Objective to be achieved within the Army Acquisition Objective for 14805 tanks for the

US Army in peacetime in order to equip and support the force during the initial stages of war. With no change in requirements, the Army ultimately would expect to procure enough M1's to fill the Army Acquisition Objective.

M1 TANK

Senator Eagleton: Has the number of tanks to be procured ever changed as a result of program cost growth?

General Keith: Yes, it has changed twice. We reduced the FY 1979 M1 procurement from 110 to 90 tanks and the FY 1980 procurement from 352 to 309 tanks. The overall Initial Operational Objective of 7058 has not changed, and the tanks not procured in FY 1979 and FY 1980 will be made up in the FY 1988 procurement.

M1 TANK PROGRAM

Senator Eagleton: By the Army's own admission, the indices used in compiling the figures in the January SAR "cause a continual under statement of the tank program requirements and efforts are now underway to change the indices which will reflect actual M1 inflation experience." What are the efforts now underway? What are the indices now employed? What are the basic components that comprise the indices? Please be specific. What are the proper figures in the Army's opinion? What are the basic components?

General Keith: The Program Manager is now using historical indices between 1972 and 1979 and prior OMB/OSD indices for 1980 to 1982. OMB/OSD current indices are used to project future costs. The Selected Acquisition Report as of 31 March 1981 will reflect these indices. The indices used to go from 1972 to 1979 dollars is 2.3854. This is made up of the Tank Automotive Command indice experience for combat vehicles of 1.55 for 1972 to 1976, and M1 actual contract indice experience of 1.539 for 1977 to 1979. The 1.539 is based on United Automobile Workers (UAW) negotiated labor rates, Bureau of Labor Statistics (BLS) indice for iron and steel and BLS indices for manufacture of durable goods. For the December 1980 SAR, the compound indice used for the same period was 1.8974. Use of the new 1972-1979 compound indice (2.3854) and prior OMB/OSD indices for 1979 to 1982 compounded to 1.3345 result in the historical value from 1972 to 1982 of 3.1834. For 1983 and beyond, current indices are used.

These figures provide a proper basis to project historical escalation to the current time frame. The compound historical indices should then be adjusted each year for actual experience as data becomes available.

M1 ABRAMS TANK

Senator Eagleton: A footnote on the January SAR indicates that the total acquisition cost does not include funding for procurement of training components, training equipment and training equipment spares, and nonrecurring production base support requirements. Are these figures understated? If so, by how much?

General Keith: The Selected Acquisition Report (SAR) does not track production base support or training equipment funding. The SAR figures are not understated for those costs which it tracks. Our budget request includes all the costs associated with the M1.

Senator Eagleton: What is the definition of "initial spares" with respect to this program?

General Keith: Initial spares are those secondary item spares necessary to support the operation and maintenance of a system for an initial period of time. The requirement is based on anticipated deployment schedule of the system on an annual basis.

Senator Eagleton: Is the "initial spares" figure understated or under funding constraints impared by other-than-Army officials -- say for instance DOD or OMB? If so, to what extent are they understated or constrained? What would a more accurate figure be?

General Keith: The initial spares for the Ml program are not understated or constrained by the Army, DOD, or OMB. Our requirements have been projected based on logistics experience gained on the Ml and similar systems.

Ml TANK

Senator Eagleton: What does the Army envision as the annual operating cost of a fleet of 7058 Ml's once fully deployed. Please distinguish between operation, maintenance, and spare parts.

General Keith: Operating and support costs are expected to be $310,600.00 per tank per year in FY 1982 dollars. The cost break out follows below. The computation considers 4065 tanks out of 7058 to be operational.

CATEGORY	COST (FY 1982 $)
Crew cost and benefits	$125,600.00
Consumption (POL and spares)	77,300.00
Depot maintenance	40,200.00
Modification materiel	2,200.00
Other direct costs	4,500.00
Indirect costs	60,800.00
TOTAL	$310,600.00

Ml Abrams Tank

Senator Eagleton. What is the current status of the Ml testing program?

General Keith. We are past the mid point in our development and operational testing overall. We have scored data for about 40 per cent of our RAM-D testing. With the exception of our RAM-D testing we have only qualitative assessment from our independent evaluators at this point. Their assessment is that the design problems encountered during Full Scale Engineering Development have been corrected and that the production tank overall is meeting its performance requirements. In the case of RAM-D testing our scored results to date show the Ml meeting or on track to meet 10 of its 13 requirements. Of the remaining three, meeting the Maintenance Ratio requirement is questionable, due primarily to the less mature Test Measurement and Diagnostic Equipment (TMDE). Use of this type equipment is a new experience for tankers, and as with any new system the TMDE and manuals have bugs to be worked out. We are concentrating on this at Ft Knox and making good progress. At this point it looks like the Power Train Durability requirement will not be met. The score should improve but we will still fall short. Most of our problems have been due to quality control and production processing during fabrication, and the resultant failures occurred within the first 1000 miles. Corrective action in this area is already underway and resulting in better tanks and power packs being delivered to the Army. As the production base matures in the near term, I expect the durability problem to go away. The final deficient area is track durability. The M1's track life is at the limit of our technology for the tank's weight class and mobility. Until improved rubber compounds can be developed, the Army will have to live with the current performance levels. In summary: The Army is pleased with the overall performance of the M1, specifically disappointed with power train durability, and taking corrective action which is expected to result in near term improvement.

Senator Eagleton: When does the Army envision approaching the Secretary of Defense for the "go-ahead" production decision?
Mr. Daoulas: We will seek a decision in early September 1981.

Senator Eagleton: What major obstacles/milestones does the Army have to overcome/pass before it can present the M1 program for DSARC approval?
Mr. Daoulas: The Army will have to assure itself and the Secretary of Defense that the M1 tank system performance and maturity is satisfactory and that the production base will be capable of ramping above 30 per month production delivery rate in accordance with the planned schedule. Test results from current Operational Test III and Development Test III must demonstrate satisfactory progress toward meeting established goals for combat mission reliability, maintainability, and power train durability, and supportability objectives.

Senator Eagleton: It is my understanding that the GAO is monitoring test results of DT/OT III test activities.
- To the best of your ability, would you please articulate any comments the GAO has expressed to you with respect to the M1 tank's performance during testing?
- Do you have any comments concerning any of the GAO's comments?

Mr. Daoulas: The GAO has been monitoring M1 tank test activities for some time; however, they have not provided the Army any comments on the current DT/OT III test activities. Recently the GAO reported their findings reference Integrated Logistic Support planning for the M1 tank. The Army has commented on the GAO report and agrees with most of the recommendations, and is in fact, or has been, implementing most of them.

Senator Eagleton: What, if any, "pitfalls" confront the Army in its efforts to meet the production goals as detailed in the January SAR?
General Keith: We have had early start-up problems meeting our production goals, but we believe these problems are now behind us. Engine delays during the past year, for the most part, were due to a multitude of production start-up problems stemming from the manufacturer's under estimation of; and hence inadequate planning for full production of major components. Problems were encountered in virtually every functional area, and in the case of the engine manufacturer the organizational structure of the company itself proved to be inadequate. The transmission contractor realized their shortcomings early on and with cooperation of the Army turned around their production problems within a reasonable time frame. The engine manufacturer on the other hand, belatedly recognizing their problems has, during the past six months, undergone major reorganization of its management concepts and structure, to

include key personnel changes from the general manager to the shop level. Intensive efforts within the engine manufacturer, from Chrysler Corporation, and from the Army have affected substantial improvements which continue to aid production toward an upward trend. These measures included intensive Army management involvement via executive level meetings, joint Army and corporate level production reviews, engine malfunction plottings, increased subcontractor component incoming inspection and test, increased Army involvement in the materiel review board process and continuous production readiness review. The quantity of engines shipped, for example, during the six-month time frame of September 1980 - February 1981 (64 engines) is almost double the total shipped during the previous 10 months (37 from November 1979 to August 1980). The most recent delay in December 1980 and January 1981, again reflecting the broader problems noted above, was due to a bearing failure resulting from improper machining of related turbine blades. That problem has been resolved and the company has regained production momentum. Overall, although trends are currently favorable, we cannot say that all causes of prior delays have been solved. We have also included $105 million in our Supplemental FY 1981 Budget request to improve our manufacturing capacity throughout the M1 production base; some of these funds will be expended to insure that our engine manufacturer has the capacity to meet the required production schedule. Until this capacity is firmly in place and the engine base is stable, outside, back-up vendors for critical parts have been established by the engine producer to sustain engine production. All in all, we believe our production problems have been addressed by competent management and that corrective actions are well underway. This belief is further strengthened by the fact that our engine manufacturer has met and is meeting their engine production in both February and March 1981.

QUESTIONS SUBMITTED BY SENATOR HATFIELD

Senator Hatfield: Many systems that the Army has fielded have encountered high maintenance requirements and low reliability levels. Examples would include the AH-1 helicopter and the M60A2 tank. Could you tell us what the Army is doing to develop systems of high reliability and low maintenance rather than emphasizing excessive performance goals which create problems when the systems become operational?

General Keith. The Army has always been extremely concerned about the maintenance manpower requirements, logistic support costs and reliability of fielded equipment, particularly during our modernization program. Army acquisition policies continue to be refined. One of the main thrusts of these refinements is that logistic supportability is now coequal with cost, schedule and performance as a driver of decisions for new acquisition programs. Army policy for materiel reliability and maintainability now has a new dimension. We require that reliability and maintainability parameters that relate directly to maintenance manpower and logistic support cost be expressed as well as parameters that relate to mission success and readiness. Innovative support concepts are developed along with development of the materiel system, with the aim of improving readiness or reducing support resources. We are emphasizing reliability early in development, seeking to help the operators and maintainers by exploiting current technology in areas such as designing in highly reliable parts and designing in testability (e.g., built-in-test-equipment).

Reliability, maintainability and supportability have become critical issues to be demonstrated by testing and resolved to the satisfaction of our decisionmakers prior to production and deployment decisions. For those systems that have been under development for some time, additional engineering and testing is scheduled after a limited procurement decision with the aim of improving reliability, maintainability and supportability before too much of the equipment is in the hands of the troops.

Senator Hatfield. Will the Patriot Air Defense system avoid the problems of complexity and lack of field suitability associated with the previous proposed SAM-D project?

General Keith. The Patriot program design approach, from inception, was based on reducing the complexity in the operation and maintenance of the system. This was implemented through a modular design approach, use of standard and common items throughout the system and through extensive use of built in test capability. Although the system design is necessarily complex to meet its performance requirements, a design approach was taken to simplify the maintenance burden. Considerable effort is being expended in the reliability and maintainability areas to minimize the problems in maintaining the system. As we continue through the development and test phases we identify short falls or deficiencies that could adversely impact complexity of support. These shortfalls are systematically addressed and corrective action taken. You may be assured that supportability is a major concern of the Army and the resources are being applied to improve our posture.

Procurement of Commercial Products

Senator Hatfield: What steps has the Army taken to procure more commercial products? Specifically, do Army development and procurement agencies give consideration to commercial products when selecting Army equipment? Also what procedures have been formulated to guarantee commercial product consideration in the Army acquisition process, and what commercial products have been recently selected for Army purchase?

General Keith: We certainly do look to the commercial market to satisfy Army materiel requirements. The procedures are documented in a DoD directive as well as our own policy provisions. The largest category of commercial products we use is managed by the Defense Logistics Agency, but our policies are designed to insure that a nondevelopmental strategy is considered for all materiel requirements. The advantages it offers are considerable, eg. lower unit cost, quick response, proven design, reduced lead time, and little or no RDTE and testing expenditures. However, we must also be mindful of its limitations. Commercial products do not always meet essential military specifications; for example, extreme temperature requirements. Additionally, the control over model changes is uncertain, increased operator and maintenance training is usually required as well as increased logistic support requirements. Some recent examples where the Army has successfully pursued a nondevelopmental strategy are trucks, both pick-up and tractor trailer, electronic and communication equipment, and materiel handling and construction equipment.

Ownership Consideration for Military Equipment

Senator Hatfield: A January 1981 General Accounting Office Report mentioned three ownership considerations which are among the most prominent detractors from effectively deploying military equipment -- logistical support, human factors and quality assurance. What is the Army doing to incorporate design criteria to avoid problems associated with these requirements?

General Keith: In the area of logistical support, recent changes to DoD and DA policy have stressed the necessity of logistical support planning during the design of new equipment. It is the Army's policy that logistical support be afforded the same degree of importance as the cost, schedule and performance parameters during the research, development, acquisition and deployment process.

In the human factors area, the Chief of Staff, Army (CSA) has taken a personal interest in the soldier-machine interface (SMI), which includes human factors and all aspects of the relationship between a piece of military equipment and the soldier who must operate and maintain it. A great deal of effort has been expended to understand and improve the role of SMI in the current modernization program. Army policy is to initiate SMI considerations early in the acquisition process. This involves participation of the Human Engineering Laboratory in design, and considerations of SMI in all testing. The CSA has tasked the US Army Training and Doctrine Command to conduct a comprehensive study to review the current practices for consideration of SMI during the materiel acquisition process, and to recommend methodologies and procedures for improving the integration of SMI in the development and deployment of new equipment.

Quality assurance is also of great importance in delivering new systems that are ready to deploy. Quality assurance can be facilitated if the development process is conducted with awareness that the military equipment developed must be produceable at a reliable quality level to be effective. Army policy requires producibility planning early and throughout the acquisition cycle to achieve this.

PLAYING CATCH-UP

Senator **Stevens**. I may have some more questions about the tanks. Why is it that we just seem to keep leapfrogging up to the Russians' capability. When are we going to start thinking about getting ahead of them?

General **Keith**. This is a good chance to close again, sir, and then I will be happy to talk about that, if you want to get into the technical things that we are doing and why.

Senator **Stevens**. Well, we will get into that when we are briefed at the Pentagon rather than get into some of those things here. I get the impression from your briefing this morning that we are playing catch-up all the way across the board.

General **Keith**. In fact that is true. Let me say one other general thing that is not classified. All of our resources went down the Southeast Asia rat hole during the 1960's. We did nothing in R. & D. except a couple of things that became a cropper. We tried a main battle tank with the Germans and it died because of management weight. We tried a new attack helicopter on our own. It was an attack helicopter that was a gun ship of high velocity design. It was finally killed in about 1971 or 1972 because of a combination of technical problems and being able to control the rotor system in order to fly as fast as we wanted an escort ship to fly and also it was killed because in fact we had come out of Southeast Asia and recognized that the problem wasn't an escort ship for troop assault in the jungle. We were getting out of that business.

The problem was what can you do from an attack helicopter to kill tanks. That is an entirely different design. That advanced attack helicopter in no way resembles what the Cheyenne was. So, in my estimation, it is a good thing we killed it.

But nevertheless we entered the 1970's then a full decade behind and the Russians momentum has continued to build. Not only have they done the R. & D. that was necessary for them to catch us technically, they have gotten into great production on almost everything and they began fielding it in enormous quantities. So our job in the 1970's was first of all, we had to do the R. & D. to close the qualitative gap of a decade long, and then the 1980's was supposed to be our get well period.

The combination of all of these things in our economy that have given us less buying power than we had hoped, the spiraling effect then of buying lesser items and getting a less buy cost quantity-wise had put us in the posture of where the actual get well with the troops had gotten to the point where it was of treat concern to all of us.

I can only say that the amended 1982 budget has put us back on a track where we can hope to get reasonably economical procurement quantities those things that are urgently needed out there to begin to close the gap.

Now, that doesn't say that we don't have the problem of the future. We can't afford to jump leapfrog-wise every decade like this. So we have got to preplan the life extension of the things like the tank, like the helicopters, and like the fighting vehicle system with preplanned block product improvements so that we can keep its utility over time up to snuff.

There will be some things that technology will allow us to do that will have a very high return technologically that we will want to jump and then there will be these other things where we are going to us a system more like the Soviets have used.

If you look at their tanks, and we have said they have a T-62, 64, 72, and now 80, and then they even have an 80 follow-on we believe in early R. & D. While they are producing the first model, they are R. & D.ing the next two, so that they are into production in less than the full development time, that is they are half-lifing, they are overlapping, and in about every 5 years we see a new model.

You can only do that by preplanning an incremental improvement and introducing that to a production facility before the full R. & D. process would have you jump every decade or so. We have got to do the same, sir.

Senator **Stevens**. We will learn a little bit more about that when we go over to the Pentagon. Is there anything further?

Thank you very much, gentlemen. We appreciate it.

SUBCOMMITTEE RECESS

The subcommittee will resume on Thursday for Army Operations and Maintenance.

Thank you very much.

[Whereupon, at 10:35 a.m., Monday, March 30, the subcommittee was recessed, to reconvene Thursday, April 2.]

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1982

WEDNESDAY, APRIL 8, 1981

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, D.C.

The subcommittee met at 9:56 a.m., in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens and Rudman.

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE NAVY

SHIPBUILDING AND CONVERSION, NAVY

STATEMENT OF VICE ADM. WILLIAM H. ROWDEN, DEPUTY CHIEF OF NAVAL OPERATIONS (SURFACE WARFARE)

ACCOMPANIED BY:
- VICE ADM. EARL B. FOWLER, COMMANDER, NAVAL SEA SYSTEMS COMMAND
- VICE ADM. WESLEY L. McDONALD, DEPUTY CHIEF OF NAVAL OPERATIONS (AIR WARFARE)

BUDGET REQUEST

Senator STEVENS. The subcommittee will come to order. We are here this morning to hear testimony on fiscal year 1982 budget request for the Department of the Navy shipbuilding program.

We are pleased to have with us this morning Vice Admiral William H. Rowden, Vice Admiral Earl B. Fowler, Vice Admiral John G. Williams, Jr., and Vice Admiral Wesley L. McDonald.

The amended fiscal year 1982 budget for Navy shipbuilding and conversion is $10.2 billion for 33 ships. This is an increase of $2.4 billion and 18 ships over fiscal year 1981.

It may be necessary to close the hearing today due to classification of materials to be covered. In that event, if members of the subcommittee or witnesses will indicate their desire to close the hearing, I will set a time for going into closed session. Most likely this would be the period when there would be more members present. If we do close the hearing, those individuals not cleared or having a need to know the subject matter will be required to leave.

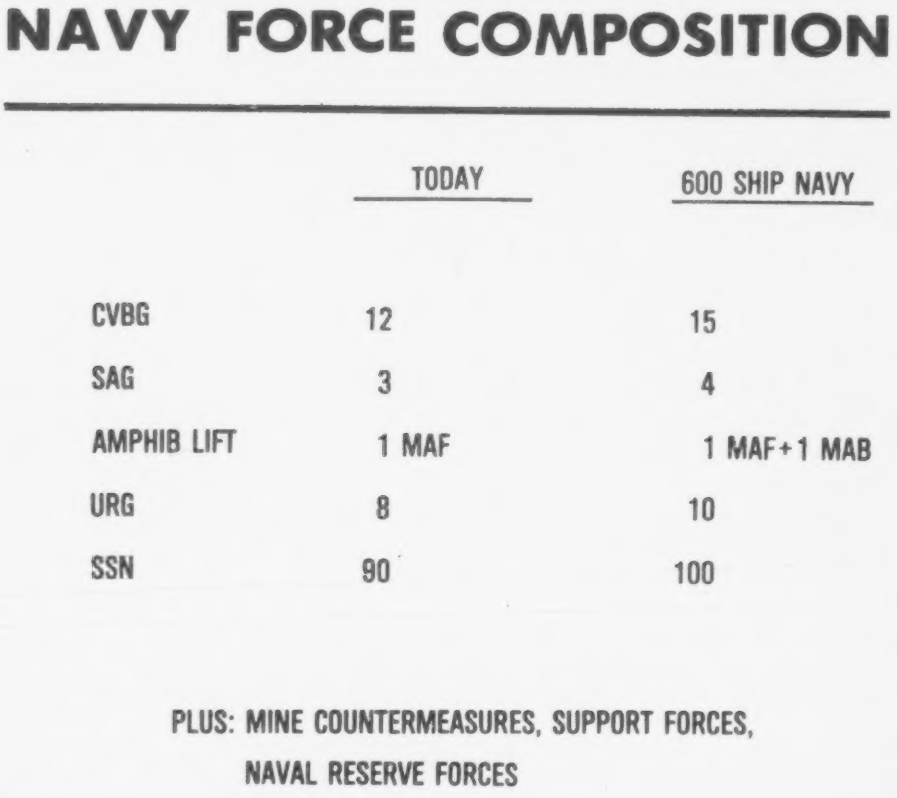
Gentleman, we appreciate your detailed statements. They have been placed in the record. I would appreciate it if you would summarize your statements.

DEVELOPMENT OF OFFENSIVE NAVY

Admiral ROWDEN. Mr. Chairman, it is a pleasure to be here with my colleagues.

The type of Navy that we want is an offensive Navy, one that is able to carry the fight to the enemy, both on the sea and ashore. We need a type of Navy that is flexible, that can be employed worldwide in the interests of the United States, and is also technically and operationally flexible in the field. In addition to that, it is necessary that we have a balanced Navy.

I have provided for you three slips of paper as a handout, Mr. Chairman, here and I invite your attention to them.



NAVY FORCE COMPOSITION

	TODAY	600 SHIP NAVY
CVBG	12	15
SAG	3	4
AMPHIB LIFT	1 MAF	1 MAF+1 MAB
URG	8	10
SSN	90	100

PLUS: MINE COUNTERMEASURES, SUPPORT FORCES,
NAVAL RESERVE FORCES

[VUGRAPH 1]

"TODAY" VERSION OF NAVY

We speak of the Navy today as being characterized by the forces shown under the "Today" column of the first handout. Twelve carrier battle groups, that is 12 attack carriers operating with their associated cruisers and destroyers. There are three surface action groups. These are offensive capable forces which are operated without a carrier. We have amphibious lift that is capable of lifting one marine amphibious force and the underway replenishment groups, (URG's), associated with replenishing and providing logistics for those forces. We also show a planning figure of 90 SSN's.

When we speak of the 600-ship Navy, which is characterized by the CNO as the 15 carrier battle group Navy, we show an increase in the associated logistics tail with that and a planning factor of 100 submarines.

PLANS TO REACTIVATE BATTLESHIPS

Senator STEVENS. With the exception of the two, the *New Jersey* and the *Iowa,* are there any other battleships in that 600-ship Navy?

Admiral ROWDEN. Yes, sir, there are four, the *Wisconsin,* the *Missouri,* the *Iowa* and the *New Jersey.* Those are the four ships of that class.

Senator STEVENS. The 600-ship Navy would have all four?

Admiral ROWDEN. Yes, sir.

Senator STEVENS. How many are in the "Today's" section?

Admiral ROWDEN. In the "Today" section there are none. sir.

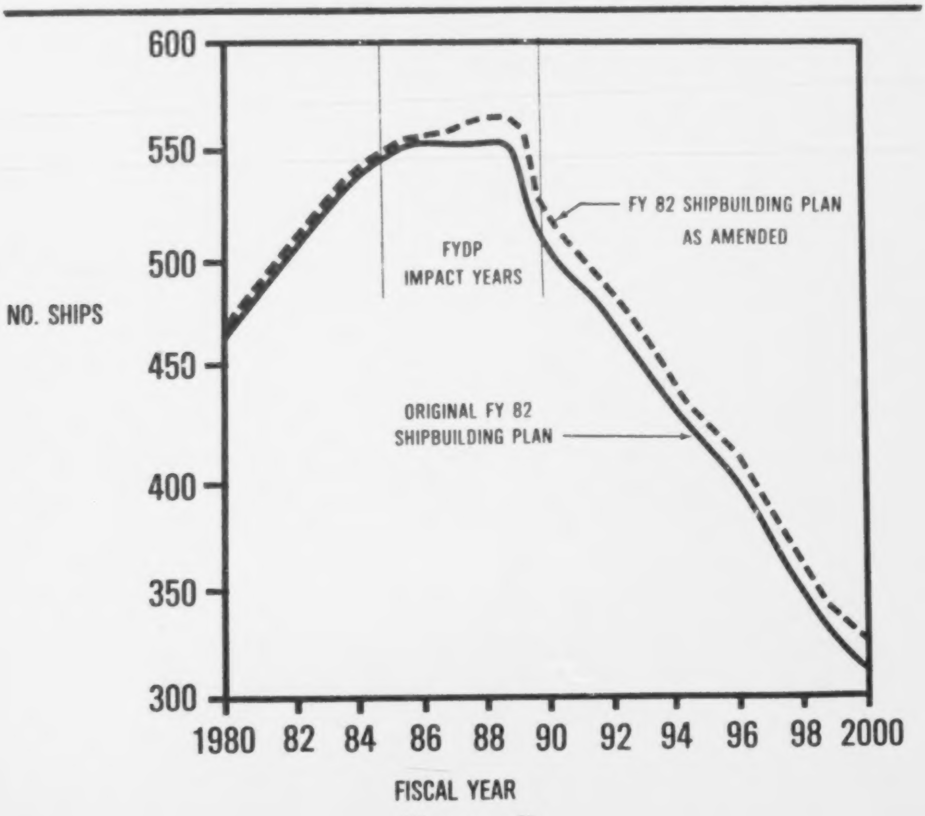
Senator STEVENS. None.

Admiral ROWDEN. Yes, sir.

Senator STEVENS. The proposal is to refloat the four that are in existence?

Admiral ROWDEN. Yes, sir, that is correct. The four surface action groups that you see in the right-hand column are centered around the battleships.

DEPLOYABLE SHIPS
(ASSUMES SCN THROUGH FY 86)



[VUGRAPH 2]

SIX HUNDRED-SHIP NAVY

The next sheet, Mr. Chairman, shows the progression that we are making at the present time toward the 600-ship Navy in deployable forces, that is forces that we send out to do the job in the 6th and the 7th Fleets and in the Indian Ocean. We are at the present time in the neighborhood of about 470 ships and we are increasing that number.

You will see two lines drawn which show the impact of the present building program. Before it was amended it generally leveled off. After amendment it indicated an upswing toward the 600-ship Navy, the upper line.

Note also on this chart that beyond the effective years of the 5-year plan there is a serious dropoff in the number of ships. This is because of two factors. One, ships wear out. They reach the end of their service life and they have to be retired. Second, there is no replacement beyond the 5-year plans so those factors together indicate a dropoff.

This is the problem faced by the country to build up to the 600-ship Navy and ultimately maintain that at a constant building rate.

MAINTAINING 100-SHIP LEVEL

Senator STEVENS. Does this indicate that in order to maintain it we would have to build 150 ships in 1992 in order to keep a 600 level?

Admiral ROWDEN. No, sir. What that means is that a ship ordinarily has a 30-year service life. If we are to maintain 100 ships, for example, we have to build between 3 and 4 ships a year to maintain that number. If we are to build and maintain a 600-ship Navy, then we would have to build between 18 and 24 ships a year to maintain that 600 number because of the life expectancy of the ships.

Senator STEVENS. Well, why do you presume that it is going to drop off in 1990?

Admiral ROWDEN. At the present time there are two factors, Mr. Chairman. One, that ships do reach the end of their service and that provides a dropoff. Second, there is no authorization that permits building during that period of time at the present.

Senator STEVENS. And you are assuming you have got authorization through 1986?

Admiral ROWDEN. Yes; that is correct.

VESSEL DELIVERY PERIOD

Senator STEVENS. Well, I still don't understand this stuff. Your 5-year defense plan assumes that in 1985, I assume, or the end of 1984 that some of these vessels that are being built now are going to start to deliver; is that right?

Admiral ROWDEN. To start to deliver, yes, sir.

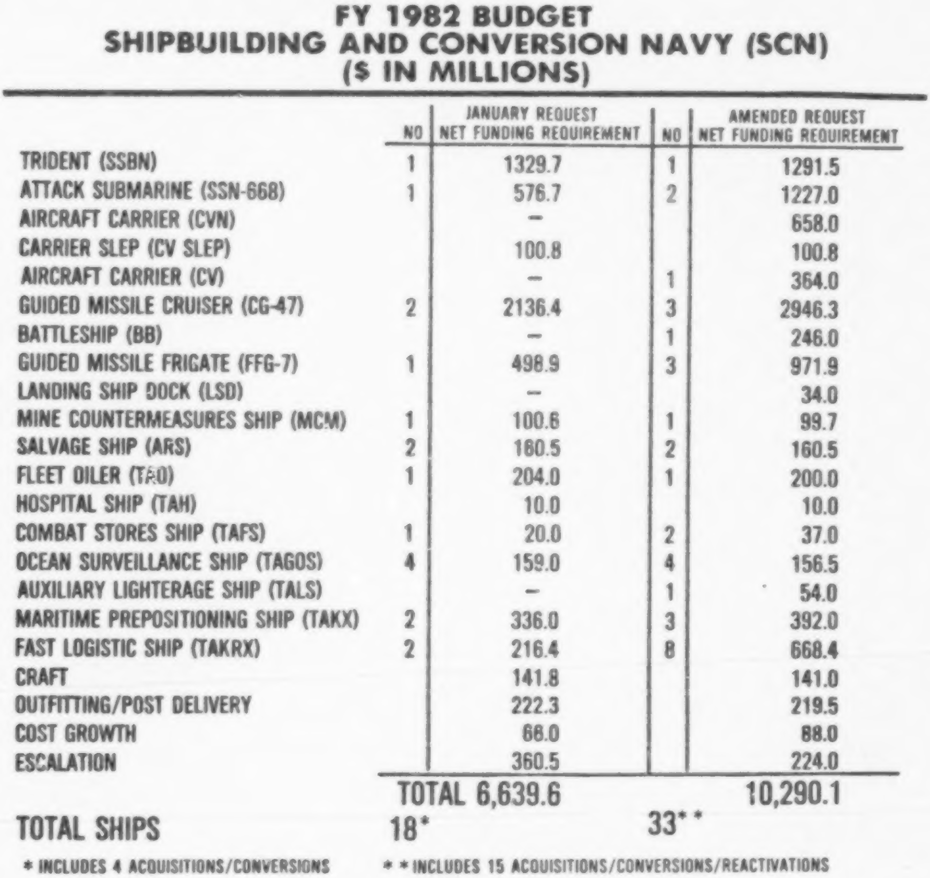
Senator STEVENS. So this is a delivery period and the impact here is for the current 5 years?

Admiral ROWDEN. Yes, sir, that is correct.

Senator STEVENS. And you don't make the assumption that you are going to have a next 5 years?

Admiral ROWDEN. We do not; that is correct.

Senator STEVENS. All right.



FY 1982 BUDGET
SHIPBUILDING AND CONVERSION NAVY (SCN)
($ IN MILLIONS)

	NO	JANUARY REQUEST NET FUNDING REQUIREMENT	NO	AMENDED REQUEST NET FUNDING REQUIREMENT
TRIDENT (SSBN)	1	1329.7	1	1291.5
ATTACK SUBMARINE (SSN-668)	1	576.7	2	1227.0
AIRCRAFT CARRIER (CVN)		–		658.0
CARRIER SLEP (CV SLEP)		100.8		100.8
AIRCRAFT CARRIER (CV)		–	1	364.0
GUIDED MISSILE CRUISER (CG-47)	2	2136.4	3	2946.3
BATTLESHIP (BB)		–	1	246.0
GUIDED MISSILE FRIGATE (FFG-7)	1	498.9	3	971.9
LANDING SHIP DOCK (LSD)		–		34.0
MINE COUNTERMEASURES SHIP (MCM)	1	100.6	1	99.7
SALVAGE SHIP (ARS)	2	160.5	2	160.5
FLEET OILER (TAO)	1	204.0	1	200.0
HOSPITAL SHIP (TAH)		10.0		10.0
COMBAT STORES SHIP (TAFS)	1	20.0	2	37.0
OCEAN SURVEILLANCE SHIP (TAGOS)	4	159.0	4	156.5
AUXILIARY LIGHTERAGE SHIP (TALS)		–	1	54.0
MARITIME PREPOSITIONING SHIP (TAKX)	2	336.0	3	392.0
FAST LOGISTIC SHIP (TAKRX)	2	216.4	8	668.4
CRAFT		141.8		141.0
OUTFITTING/POST DELIVERY		222.3		219.5
COST GROWTH		68.0		88.0
ESCALATION		360.5		224.0
	TOTAL	6,639.6		10,290.1
TOTAL SHIPS	18*		33**	

* INCLUDES 4 ACQUISITIONS/CONVERSIONS

* * INCLUDES 15 ACQUISITIONS/CONVERSIONS/REACTIVATIONS

[VUGRAPH 3]

FISCAL YEAR 1982 SHIPBUILDING REQUEST

Admiral ROWDEN. Finally, Mr. Chairman, the next sheet shows the fiscal year 1982 shipbuilding and conversion Navy budget in two columns. The first was that requested in January by President Carter and the second, or the right-hand column, is that which has been amended by the Reagan administration and is before the Congress at the present time.

The total amended budget is for 33 ships for a total of $10.3 billion. This provides for 18 new construction ships, 2 reactivations which are the battleship and the carrier reactivation, three acquisitions, that is procurement, and 10 conversions.

The request provides for 1 strategic ship, namely a Trident submarine, 11 combatants, cruisers, destroyers and attack submarines, and 21 support ships.

The percentage increase between the original submission and the amended submission is a 55-percent increase.

PREPARED STATEMENTS

Senator STEVENS. Thank you Admiral Rowden. Your prepared statement and that of Admiral Fowler will be inserted in the record at this point.

[The statements follow:]

PREPARED STATEMENT OF VICE ADM. WILLIAM H. ROWDEN, USN

DEPUTY CHIEF OF NAVAL OPERATIONS (SURFACE WARFARE)

Mr. Chairman and members of the Committee, I am Vice Admiral William H. Rowden, USN, the Deputy Chief of Naval Operations for Surface Warfare and the Shipbuilding and Conversion Navy (SCN) appropriation sponsor.

I am very privileged to have the opportunity to speak to you today on required Navy force levels and the building program needed to attain those levels. I will speak of these within the context of the warfighting capabilities required by the U.S. Navy described a few weeks ago by Vice Admiral McKee, the threat on which you were briefed by Rear Admiral Shapiro, and the "600-ship Navy" testified to by Secretary Weinberger and Vice Admiral Holcomb.

Let me begin with the a few words on the essential characteristics which our normal forces most possess -- flexibility and offensive power.

Let's look at flexibility first. Our strategic and ecomomic interests are worldwide. The maritime threat we face is also worldwide. Thus we must have a Navy capable of both reaching a wide area and supporting a variety of national interests and potential threats to those interests. To concentrate on any one area such as the Indian Ocean, or on one mission such as convoy escort to the exclusion of other areas and missons, would allow potential adversaries too much freedom of action and would be a serious error.

The second required characteristic is offensive power. Unlike land warfare, occupation of space at sea provides only transient benefits. The vast size of the area involved and the inherent mobility of maritime forces allows static positions to be bypassed or avoided. Thus we are faced with two choices. We must either build enough ships to physically occupy all important maritime areas at once -- a fiscal and physical impossibility -- or we must build ships with enough power to destroy forces capable of challenging our control of vital sea lanes or areas. I know that admirals are often accused of being too bound by tradition, but I can think of no way of improving upon John Paul Jones' dictum that one must be willing and able to "go in harm's way" if one is to challenge successfully an attempt to block the sea lines of communication.

In order to attain these characteristics, a major thrust of the Navy's program is to diversify our capability by providing many more ships with offensive punch. It is vital that we improve our ability to threaten an enemy from a multitude of platforms, submarines, surface ships, and aircraft.

All I have said thus far boils down to the fact that we need a balanced force posture -- a force posture capable of winning against challenges over which we have little control, for they will be dictated by the enemy. Some challenges will be extremely demanding; others less so. In other words, we need a mix of ship capabilities. The hard facts are, that until recently, we have concentrated our efforts on too few, less capable, cheaper ships. We now face the hard choices involved to even up the force balance, and build more capable ships which are generally more expensive.

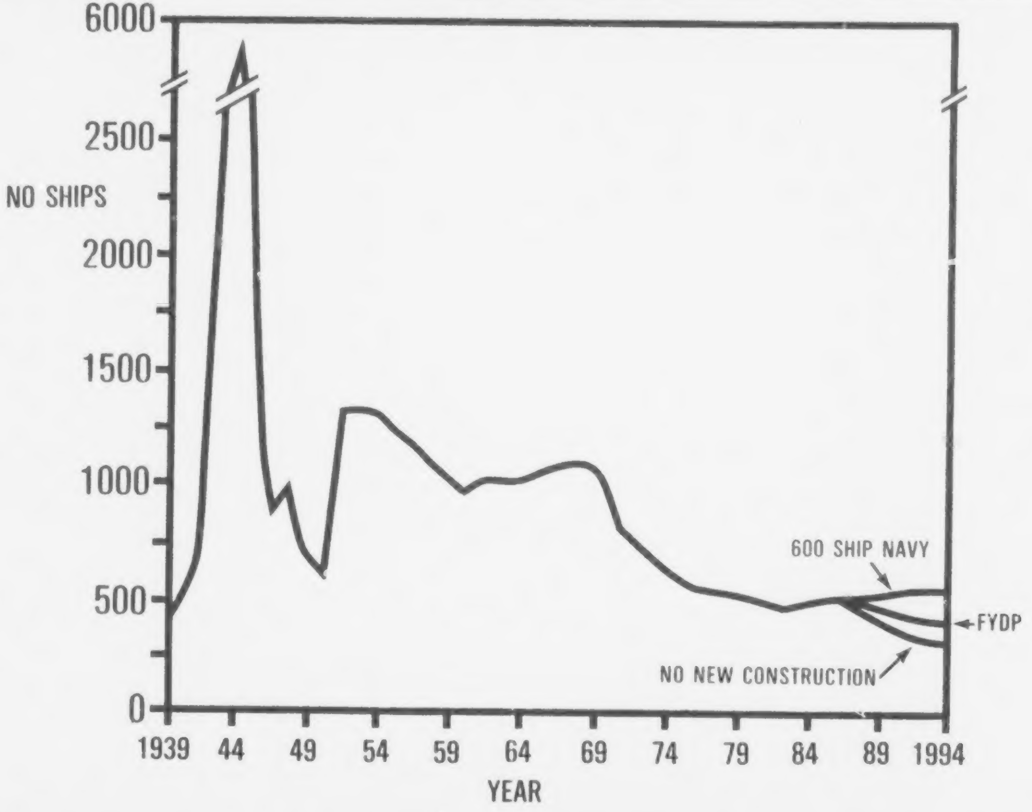
FORCE PLANNING

In order to meet our adversary's worldwide challenge with a Navy capable of (VG-1) taking the offensive, we are making our plan around the "600-ship Navy" Secretary Weinberger mentioned. As Vice Admiral Holcomb pointed out, this means 15 rather than 12 Carrier Battle Groups; 100 rather than 90 attack submarines; 1.5 rather than 1.15 MAF lift; and the necessary support and logistic force to sustain the fleet which would result.

This viewgraph shows the ship force levels over time and projects three force options through 1994. The lowest of the three branches at the right margin indicates force levels if we cease building ships, the center branch depicts the projected forces from the FY 81 budget, and the upper branch the 600-ship Navy.

In outlining our minimum ship requirements, I will deal with a number of separate categories: strategic and attack submarine forces, carrier forces, surface combatant forces (cruisers, destroyers, frigates), amphibious lift forces, mobile logistics support forces (MLSF), and mine warfare forces.

SIZE OF THE FLEET
(NAVY PROJECTED TO 1994)



(VG-1)

STRATEGIC SUBMARINE FORCES

Dealing first with strategic submarines (SSBN), the Navy embarked on the TRIDENT shipbuilding program with authorization of the lead ship in 1974 to replace the aging 41-ship POLARIS/POSEIDON force. Two of the oldest POLARIS submarines have been inactivated and were decommissioned last month. The remaining eight are being removed from the strategic nuclear forces to be utilized as SSNs. The first TRIDENT submarine becomes operational in late 1982. Although this will result in a smaller number of SSBNs, force capability will actually be increased because of the more capable TRIDENT submarine (24 missile tubes vice 16) equipped with the more capable TRIDENT I missile. Force capability is also being increased by backfit of this TRIDENT I missile on 12 POSEIDON submarines. The ultimate TRIDENT force level is undefined and under continuing review. It will be influenced by several interrelated factors. Primary among these are: the requirement to replace our currently operational SSBN forces as a result of aging and technological obsolescence; possible changes in the role SLBMs will play in the future United States mix of strategic forces; and political considerations, such as the requirement for essential equivalence and strategi arms limitations agreements.

(VG-2) SSBN force levels are best displayed in terms of missile launchers as shown in this viewgraph. Starting with 656 launchers at the end of FY79, there are now 544 launchers on the 16-launcher tube POLARIS and POSEIDON SSBNs. By the end of FY81, with the removal of the POLARIS submarines from stragetic forces, launcher levels will decrease to 496. Thereafter, based on the Five-Year Defense Program, SLBM launcher levels increase with TRIDENT deliveries until POSEIDON submarines are retired. With the retirement of the POSEIDON submarines by their presently planned extended service life of 30 years, available launcher levels will again decrease in the mid-1990s because the POSEIDON force was built at a much faster rate than that planned for TRIDENT. With a plan to resume a TRIDENT building rate of 3 ships every two years in 1985, we could reach a low level of 564 SLBM launchers in 1995/1996. If the TRIDENT building rate remains at one-per-year, the nadir becomes 456 launchers in 1997.

SLBM force capability is, to a large extent, dependent on the missile carried in the launchers. Thus, for the same capability, fewer launchers or SSBNs would be required if the launchers carry a more capable TRIDENT II (D-5) missile vice the TRIDENT I (C-4) missile.

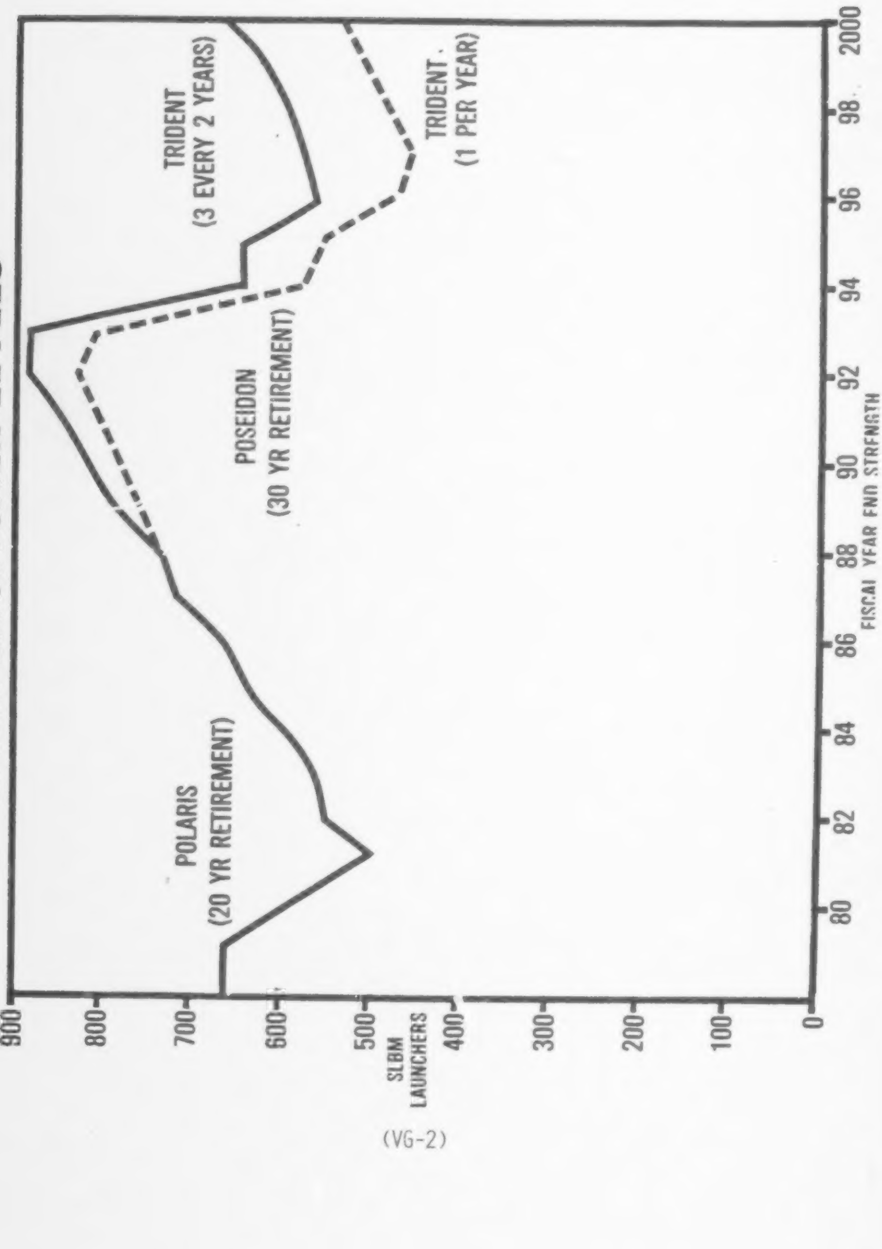
ATTACK SUBMARINE FORCE

The ability of our multi-mission, nuclear powered, attack submarines to operate covertly and with high survivability makes them our most effective ASW system for forward area operations particularly in waters which would be untenable for other forces. Given the SSN's staying power, quietness, superior sensors, mobility and significant kill potential, these submarines also are primary ASW weapon systems in open ocean warfare. Whether operating in their relatively new role in direct support of the carrier battle groups or in more traditional, independent operations in forward areas or choke point barriers, the SSNs have unique capabilities. A major role now evolving for our SSNs is strike warfare using the land attack version of the TOMAHAWK cruise missile.

Because of the increasing capabilities and size of the Soviet Naval threat, it is essential that we maintain an adequate SSN force level. Since 1973, the minimum force level goal has been 90 SSNs. The JCS have consistently identified requirements for many additional SSNs; however, the figure 90 was based primarily on the need for a balanced Navy, consideration of the threat, the qualitative superiority of our SSNs and fiscal constraints. This minimum force of 90 SSNs has been critically reevaluated relative to Soviet submarine developments, new SSN missions, and in view of the Navy's goal for 600 active ships including 15 carrier battle groups. The Navy's new force level goal is at least 100 nuclear attack submarines. These additional SSNs will improve our capability to counter the Soviet submarine fleet, which is continuing to improve in quality. An increase in SSN force level is also consistent with increasing the carrier battle groups from 12 to 15, the associated increased SSN direct support requirements, and will help to meet the increased SSN demand for strike warfare tasking. It must be recognized that the 100 SSN force level is still an austere level making it incumbent upon us to maintain nuclear attack submarine qualitative superiority.

(VG-3) This viewgraph shows that a nuclear attack submarine force level of 90 will be reached in FY82 based on previous authorizations and the continued conversion of ex-POLARIS SSBNs to SSNs upon completion of their patrols as planned. However, it also shows that with a one-per-year building rate, the SSN force level drops below 90 in 1989 and reaches 60 in 2005. A building rate of 3 to 4 per year is required to reach and maintain a force level goal of 100 SSNs.

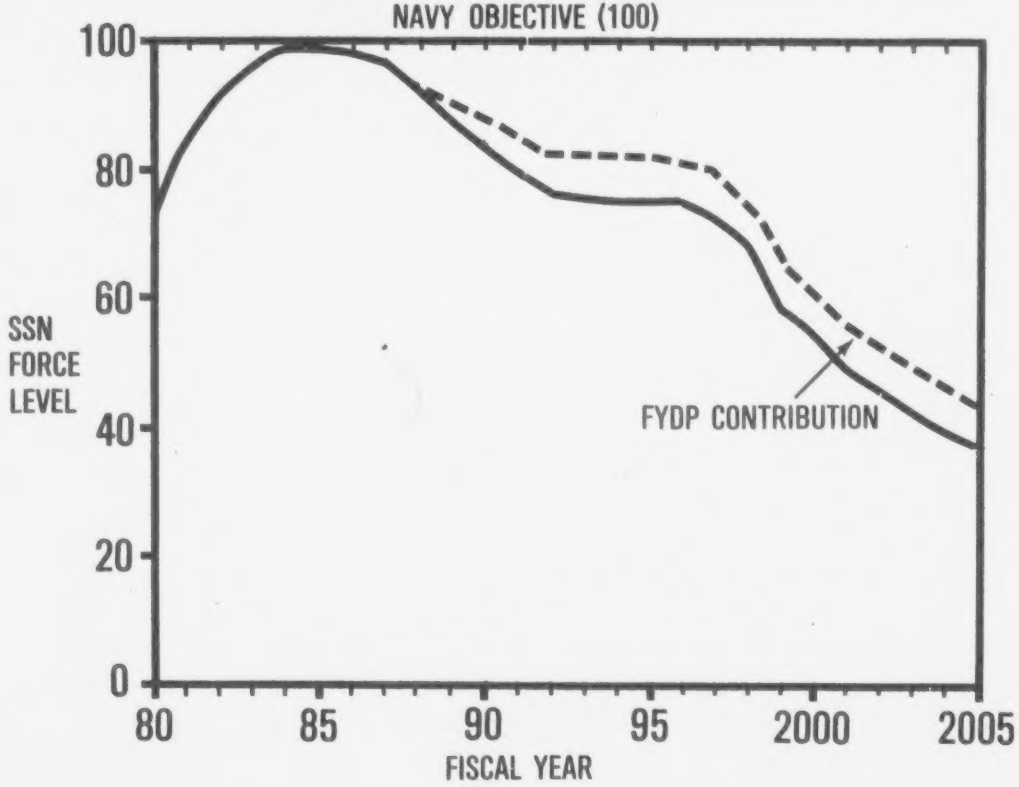
SLBM LAUNCHER LEVELS



(VG-2)

ATTACK SUBMARINE FORCE LEVELS

(ASSUMING SCN THROUGH FY 81)



(VG-3)

AIRCRAFT CARRIER FORCE LEVELS

Initiatives to increase and maintain force levels at 15 CVs have already been initiated by the LEXINGTON extension and the two issues in the FY 81/82 amendment and supplemental proposals - the ORISKANY reactivation and CVN-72. With the previously approved extension of CORAL SEA through FY86 and delivery of CARL VINSON in FY82, the total CV force level will build to 14 ships. If ORISKANY is approved and reactivated, the total will increase to 15 by mid-FY84. That total includes one ship in the currently-approved SLEP Program for four carriers, which will last through 1989. The next ship delivery will be CVN-71, delivering in 1988. Beyond that point, programs will have to be in place, which will require near-term action to initiate, to maintain those carrier force levels. Potential (VG-4) programs required could include the further extension of CORAL SEA and MIDWAY, an additional service life extension program to follow the already-approved CVN-71. All of these initiatives will be critical in maintaining a carrier force level of 15 carrier battle groups beyond the year 1994.

In addition, efforts are continuing toward the development of a design for a smaller carrier that would serve to augment the large deck carrier within the battle group. The design will incorporate sufficient flexibility to allow the ship, with accompanying surface combatants, to act independently in an area of lesser threat.

SURFACE COMBATANT FORCES

Cruisers and destroyers operate with the carriers in battle groups. They also perform missions or team together as surface action groups. In addition, they escort amphibious task forces and underway replenishment groups. They are designed to function in high threat areas and are equipped with the requisite weapon systems, command and control facilities, engineering redundancy and sustainability. Frigates, on the other hand, are designed as open ocean escorts.

They are smaller, less capable (and less costly) warships, which are intended to operate in lower threat areas. The primary mission of a frigate is anti-submarine warfare, whereas the cruiser and most destroyers are multi-purpose ships with capabilities in several warfare areas.

Insights gained from our review of the rationale underpinning current force level objectives led us to seek a minimum, balanced, and capable force structure which supports global operations, sustains present deployment commitments, provides increased offensive capability, capitalizes on emergent technology, complements allied forces and enhances the adequacy of residual forces.

Specifically, our alternatives were developed to maintain ASW capability, enhance AAW capability and to augment offensive power and strategic flexibility. In so doing, we placed emphasis on total force capability, vice numbers of ships, in developing a realistically attainable and capable minimum force level objective.

The primary emphasis in development of the surface combatant force structure is placed on accomplishing tasks expected to be assigned to surface combatants. These tasks include battle group operations, surface action groups, Marine amphibious force support, military convoy escort, and Mobile Logistic Support Force support. Total numbers of ships required are a function of unit capability and are derived from the numbers of ships required to carry out each task and the number of tasks expected to be conducted simultaneously.

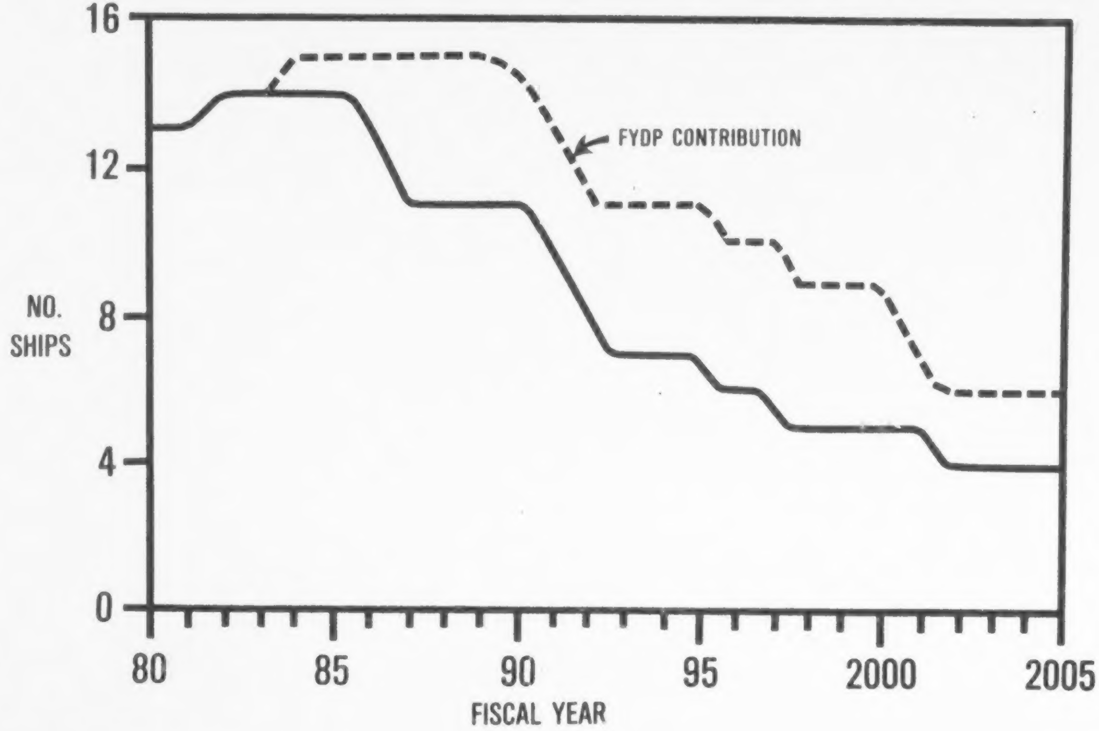
Considering initially the carrier battle groups, force sizing is based on the projected employment of the battle group. Most current force level derivations assume 2 carriers per battle group in the highest threat environments. When two carriers operate as units of a single battle group in close proximity, three AEGIS ships are considered the minimum necessary for AAW defense. When operating as a battle group organized around a single carrier, two AEGIS cruisers are required. In addition to carriers and AEGIS cruisers, a mix of other cruisers and guided missile destroyers plus ASW outer screen ships is required to fulfill battle group requirements. This results in the following battle group requirements for surface combatants:

CVBG	AEGIS Cruisers	Other Cruisers-Destroyers	Total
15	23	67	90

The surface action group or SAG tasks are in moderate to high threat environments for which a carrier battle group is not available. SAG's have been utilized in the Middle East and Caribbean regions. SAG's may also be the most

AIRCRAFT CARRIERS

(ASSUMING THROUGH SCN FY81)



(VG-4)

appropriate level of response to other crises in the Third World and are necessary to meet the Navy's three-ocean commitment in wartime. SAG utility in the future is dependent on the development of cruise missile technology to enhance dispersal of offensive power and AEGIS ability to provide adequate AAW without the presence of a carrier. The striking power of the SAG can also be enhanced significantly by the addition of a battleship properly equipped with cruise missiles. Four SAG's are necessary to satisfy contingency requirements. The minimum number of surface combatants required for each SAG is:

AEGIS	Battleships	Other Cruisers-Destroyers	Total
1	1	3	5

A minimum of 20 surface combatants are needed to fulfill this 4 SAG requirement.

Tasking for Marine amphibious support is a function of the Marine Amphibious Force Planning Goal. A revised goal of 1.5 MAF lift has been established. The minimum number of surface com batants needed to support this task is:

Cruisers-Destroyers	Frigates	Total
14	8	22

Force levels that support the protection of military shipping are extremely sensitive to the number of convoys to be protected and the contribution of allies. Allies could be expected to pro vide escorts for some convoys thereby reducing U.S. requirements. Based on the expected range of convoy requirements, we have as sumed the U.S. Navy must be able to provide about 70 surface combatants for military convoy escort requirements.

Mobile logistics are absolutely vital to the Navy's ability to conduct prompt and sustained combat operations. Underway re plenishment ship operations span the spectrum of threat exposure level and require a significant measure of protection. Plans and studies have identified a requirement for 3 to 5 surface combatants in support of an underway replenishment group. Estimates of the number of underway replenishment groups vary depending on battle group employment and forward base availability assumptions. Minimum force objectives for surface combatants in support of this task are expected to be about 40 surface combatants.

(VG-5) The total surface combatant force level goal based on this "Top Down" assessment would be 238 ships as summarized in Table 1.

The 238 ship surface combatant force outlined herein is consid ered the minimum acceptable force. As already stated, this minimum must contain the appropriate mix of ships or more ships will be required. For example, if fewer AEGIS ships are programmed, then more ships of lesser capability would be needed to satisfy the total force capability requirement. Similarly, if the capabilities of the DDGX should be less than those assumed in this analysis, more surface combatants and support ships would be needed. If the individual capability of the ships to be added is too low, then numbers alone will not solve the problem.

With the quality and quantity of the minimum prudent future force levels established, I will now address where we expect to be in the near future based on ship authorizations of the recent past, and what is needed to reach the required force level.

The active surface combatant force structure at end FY81 will be 188 ships composed of 66 multi-purpose guided missile cruisers and destroyers, 43 ASW destroyers, and 79 frigates. This is where we are today. To portray the future, I have constructed a series of graphs which show what will happen over time to our surface combatant forces assuming normal retirement and construction of the ships authorized and appropriated through FY81.

(VG-6) In viewgraph 6, we see that ASW destroyer force levels will exceed requirements until 1988 when we fall below the Navy's minimum requirement and remain there through the end of the century. Destroyers are maintained at that level as a result of the DD-963 SPRUANCE class building program which will complete shortly. As indicated, we will need at least six more ships with that or a similar ASW capability.

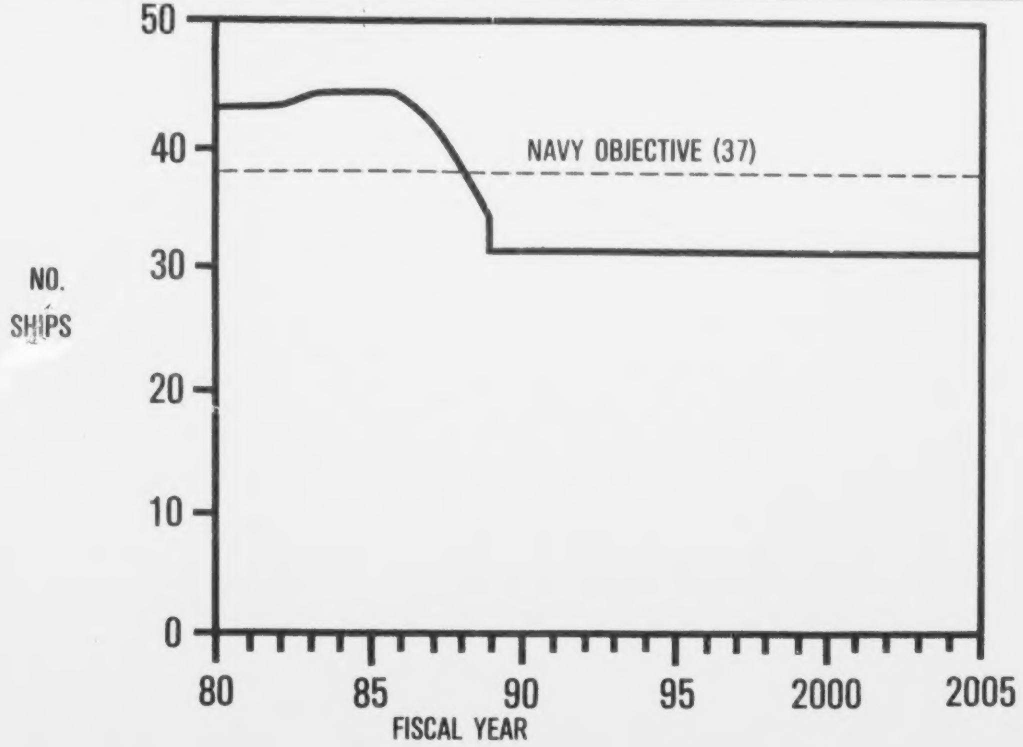
SURFACE COMBATANT FORCE LEVEL NAVY OBJECTIVE (238)

	CGN	CG47	DDGX	DDG-993	DD-963	FF/FFG
1-1 CV BATTLE GROUP						
7-2 CV BATTLE GROUPS						
2/3 CG-47		23				
2/5 DDGX/CGN	6		31			
4 DD-963					30	
4 SAGS						
1 BB						
1 CG-47		4				
3 DDGX			12			
AMPHIBIOUS FORCE (1.5 MAF)						
10 DDGX			10			
4 DDG-993				4		
8 FFG/FF						8
CONVOYS						
1 DD-963					7	
9 FFG/FF						63
URGS						
1 DDGX			10			
3 FFG/FF						30
	6	27	63	4	37	101
					137	101

(VG-5)

ASW DESTROYERS

(ASSUMING SCN THROUGH FY81)



(VG-6)

(VG-7) Viewgraph 7 shows the situation with multi-purpose guided missile cruisers and destroyers. We are well below our objective now and will experience a drastic force level decline in the mid-1980's and early 1990's due to loss of the DDG-2 and DDG-37 classes, both of which were built in the 1960-1964 timeframe, and subsequent cruiser retirements. The overlay indicates the effect of introducing the CG-47 class as per the Five Year SCN Plan. Minimum Navy requirements are reached in 1988, but the drastic decline thereafter is not arrested.

(VG-8) The final viewgraph, shown here, portrays the composite picture of what will occur with battle group surface combatant forces. Again, the overlay shows the effect of the Five Year SCN Plan. In reviewing the situation, it is obvious that our problems are most serious in guided missile cruisers and destroyers. Further clouding the picture is the fact that the only building program currently underway is CG-47. The DDGX is still in development. It is planned for authorization in FY 1985 in the 1982-86 Five Year SCN Plan.

Going back to the last viewgraph, this overlay depicts the results of the latest approved 1982-86 Five Year SCN Plan on cruiser and destroyer force levels. As can be seen, the earliest possible introduction of the CG-47 class AEGIS cruisers will significantly upgrade surface combatant capability and assist in meeting minimum requirements. The number 1 priority in surface ship construction remains the CG-47 class in numbers but the DDGX program will be just as critical in achieving and maintaining minimum cruiser and destroyer force levels. It must be instituted as soon as is feasible. It is also obvious that we must plan to extend the service lives, coincident with combat system improvements, of existing cruisers and destroyers on a selective basis in order to bridge the gap but not as a substitute for new construction.

(VG-9) Turning to the low end of the surface combatants, the frigates, the situation is more favorable. Our frigate Navy is relatively new; the FF-1052 class and FFG-1 class were completed in the late sixties and early seventies. With the FFG-7s in the FY81 authorization, the FFG-7 class under construction will bring 46 ships into the force by 1985. As the graph depicts, FFG-7 deliveries will rapidly bring us from 84 ships at the end of FY81 to exceed our minimum objective level by 1986. As has been noted however, some frigates in excess of this requirement are to be transferred to the Naval Reserve. The overlay depicts the results of the Five Year Plan on frigate force levels.

When we look at the force structure in the NATO alliance, the same trend toward a frigate Navy is evident. Offensive strike and battle force assets are declining while defense support, escort forces are remaining relatively stable in force levels. The NATO balance between defensive forces and maritime strike forces is steadily tipping in favor of low threat, defensive protection capability at the expense of offensive strike power.

I should stress again that these force levels for frigates are minimum requirements. We can always use more ships and would undoubtedly need more in a general war. We are initiating a plan to transfer twelve FF-1052 class frigates into the NRF. This will establish Naval Reserve participation in the Navy's wartime ASW mission. We are continuing to examine the alternatives to increase the Naval Reserve surface combatant force level, perhaps to as high as 24 frigates. FFX, still under study, is intended to fill that gap although no design has been chosen because of the interruption of the design effort in FY 81. Reserve frigates and FFX capitalize on the capability and potential of the Naval Reserve Force in peacetime as well as general war.

Of continuing concern, particularly in the tight fiscal climate in SCN planning, is that we have a serious inventory imbalance between frigates on the one hand and cruisers/destroyers on the other. We face force level deficiencies in battle group capable AAW cruisers and destroyers which will become more critical with time. To reverse this trend, we must adopt a vigorous construction and modernization program that will redress this imbalance. However, both construction and modernization are necessary. To attempt to substitute one for the other is folly and simply evades the issue.

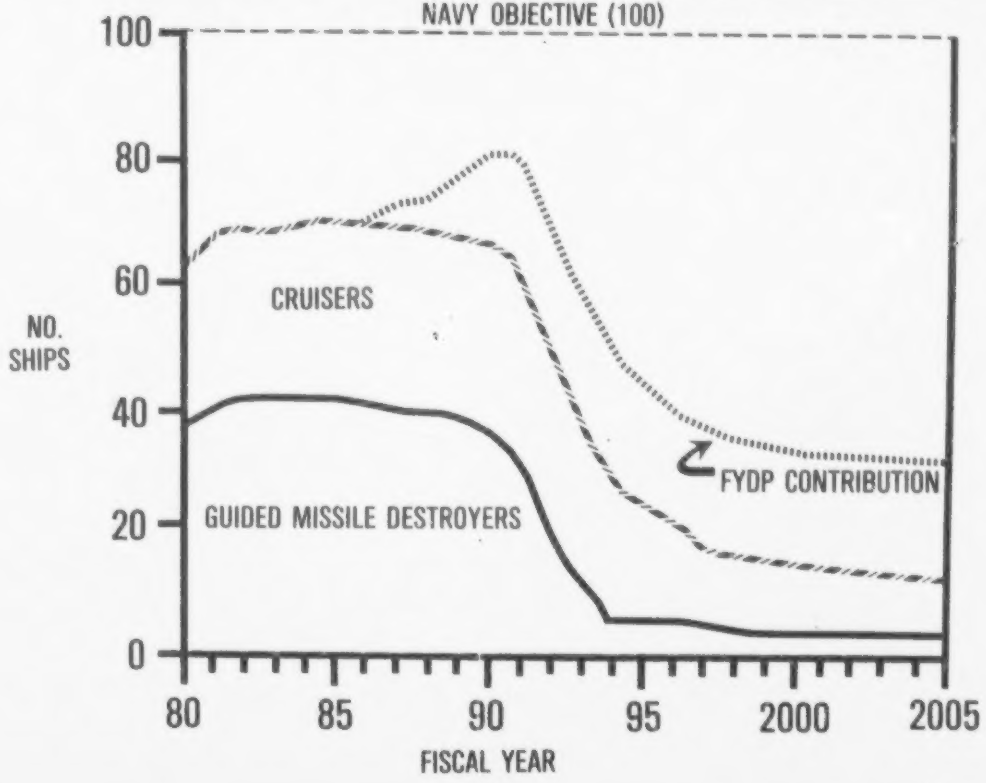
MOBILE LOGISTICS SUPPORT FORCES

The force level objective for Mobile Logistics Support Forces (MLSF) in support of a 15 CV / 4 SAG / 1.5 MAF lift Navy is 69 ships broken down as follows:

Multi-product station ships (AOE/AOR)	-	15
Oilers (AO/TAO)	-	29
Ammunition ships (AE/TAE)	-	16
Refrigeration/Stores ships (AFS/TAF)	-	9
	Total	69

COMPOSITE

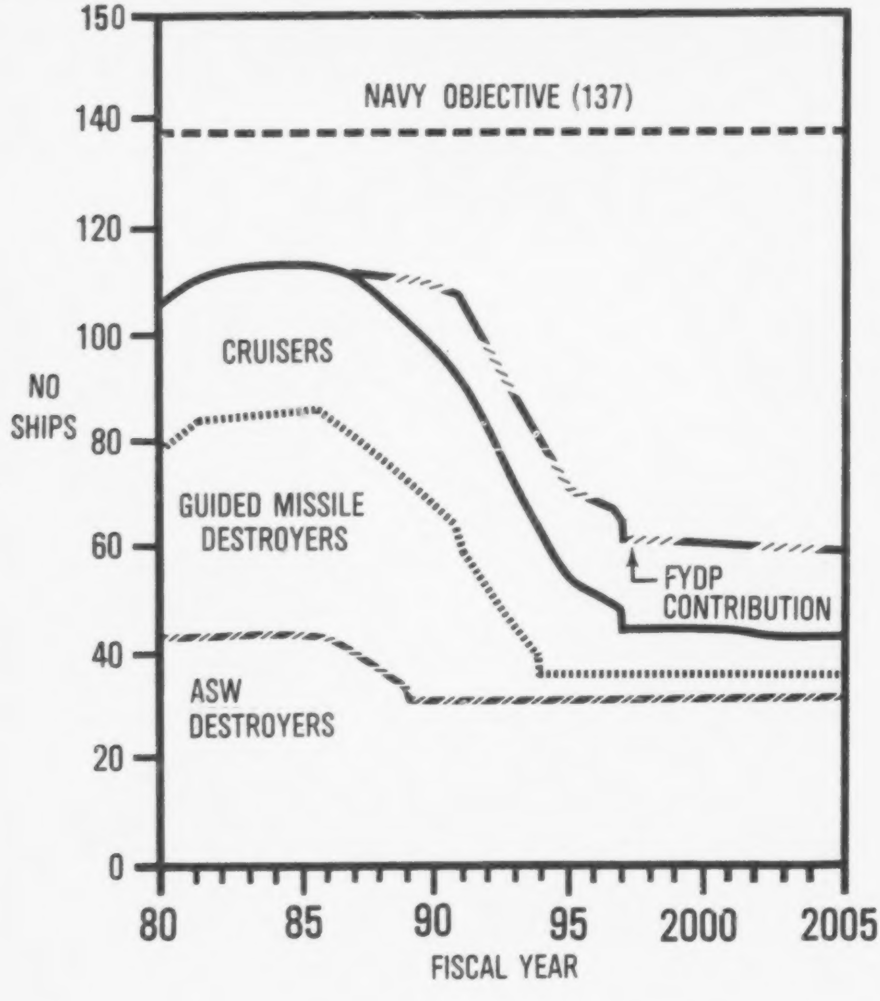
CRUISERS/GUIDED MISSILE DESTROYERS



(VG-7)

COMPOSITE GUIDED MISSILE CRUISER/DESTROYER AND ASW DESTROYER-(CG/CGN/DDG/DD)

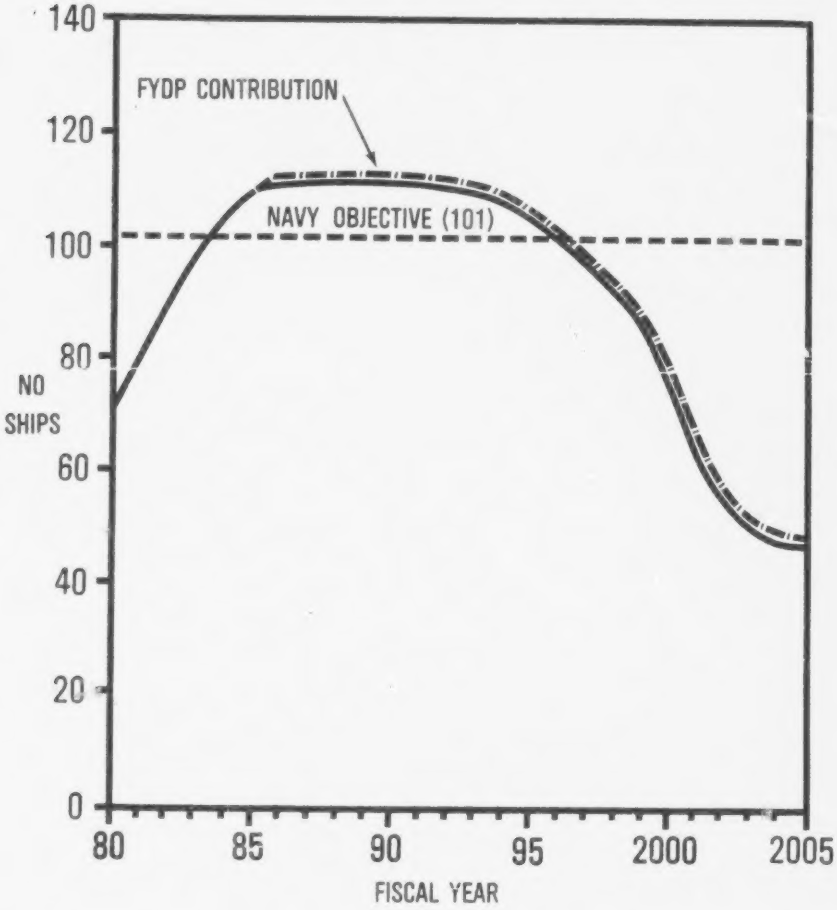
(ASSUMING SCN THROUGH FY 81)



(VG-8)

FRIGATES (FF/FFG)

(ASSUMING SCN THROUGH FY 81)



(VG-9)

Minimum MLSF force level objectives have been developed from experience and studies which are frequently updated to incorporate evolutionary developments such as changing combatant force levels, new operational scenarios, overseas basing, improved weapon systems with peculiar support requirements, increased civilian manning of fleet support ships, and fiscal considerations. MLSF force level determination involves the definition of forces to be supported, the location of these forces in four ocean theaters, and a projection of force operating profiles such as carrier battle groups, surface action groups (SAGs), or amphibious ready groups (ARGs). Force compositions are used in force and theater scenarios to develop projected product consumption. Ship propulsion characteristics, aircraft characteristics, sortie rates, and ship crew sizes are used to calculate the daily demand for propulsion fuel, aviation fuel, ordnance, provisions and stores for each ocean theater for peacetime, non-mobilization contingencies, and mobilization contingency situations.

The types and classes of underway replenishment (UNREP) ships programmed are used to provide the product demand of the combatant forces in each scenario/theater situation. AOEs and AORs operating directly with combatant forces are used as station ships to provide force endurance. Shuttle AOs, AEs, and AFSs are used to provide product transportation from forward ports to combatant task forces. Commercial tankers and freighters are used to provide resupply transportation from CONUS to forward ports. UNREP force level requirements are calculated for a range of forward ports to task force distances in each theater, and a baseline case UNREP force of dedicated Navy ships is defined for various scenario/theater situations. Force levels herein assume optimistic forward basing that is less than 1000 miles from forward base to battle group.

Assuming new construction through FY-82, the following graphs depict what would happen to Mobile Logistic Support Forces over the next two decades.

(VG-10) MULTI-PRODUCT STATION SHIPS (AOR/AOE)

The force level objective for multi-product stations ships is 15, one for each carrier. We now have 11, 4 of the more capable AOEs and 7 AORs. The AOEs reach retirement age in the mid-1990s followed by the AORs at the turn of the century. The current ship shortfalls in this category could be temporarily filled by using 1AE and 1 AO until new AOEs are provided, but this would exacerbate current AO/AE shortfalls.

(VG-11) OILERS (AO/TAO)

The force objective for shuttle AOs and TAOs is 29. This is based on optimistic forward basing and is highly sensitive to increases in distance. It is a minimum number for combat readiness, and tanker augmentation is required. As shown, our current shortfall is 10 ships. Using an AO to satisfy the multi-product station ship requirement mentioned above increases the AO/TAO shortfall. These force levels are based on our demonstrated success in extending oilers that have already exceeded their estimated service lives. We have recently determined the maximum number of years we can expect to extend these overage ships; however, even those extensions will not bring force levels to the required number.

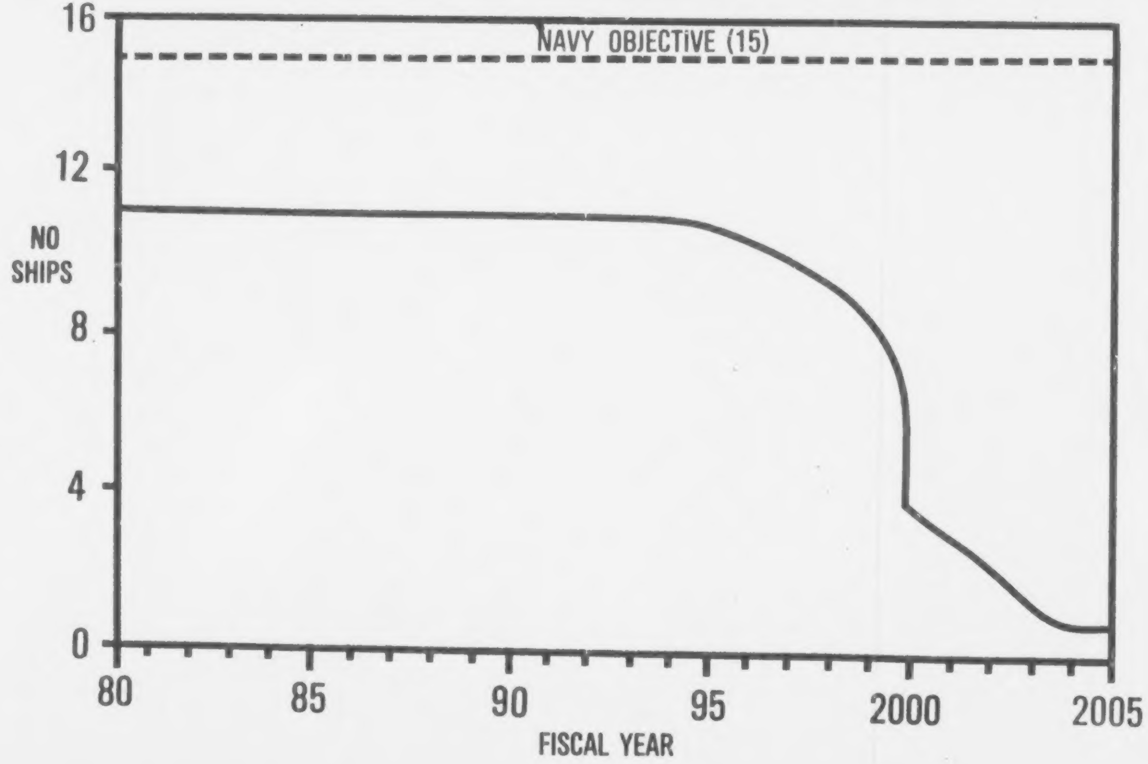
Even if replenishment oilers are authorized, in the near term, deliveries would not occur until the mid-eighties. Charter tankers will be required to fill near term wartime shortfalls. The concept of chartering tankers is currently being evaluated. However they cannot refuel combatants without fueling rigs. Their primary life is to provide fuel to AOE/AORs or AOs/TAOs. Today we are operating a charter tanker in the Indian Ocean in this resupply shuttle ship role with excellent results.

The overlay to the viewgraph depicts the AO/TAO force levels. As can be seen, we need to continue and expand our AO/TAO building program. To meet minimum peacetime/crisis requirements, we will have to extend the service life of selected ships.

(VG-12) AMMUNITION SHIPS (AE/TAE)

The assumed force level objective for shuttle AEs/TAEs is 16 based on optimistic forward basing. AE requirements are less sensitive to the number of battle group and basing assumptions than are the oilers. There are currently 13 AEs; 1 is needed to fill the AOE station ship shortfalls, so there is inadequate capacity here. Force decline begins in the early nineties with retirement of the AE-21 and 23 classes, and then levels out until after the turn of the century.

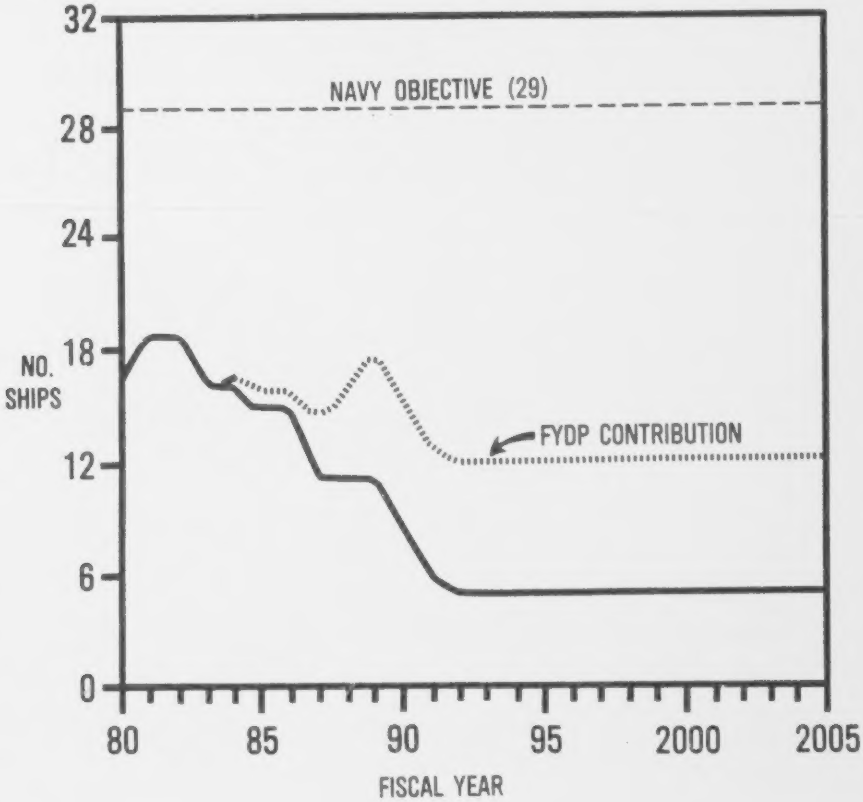
AOE/AOR
(ASSUMING SCN THROUGH FY 81)



(VG-10)

AO/TAO

(ASSUMING SCN THROUGH FY81)



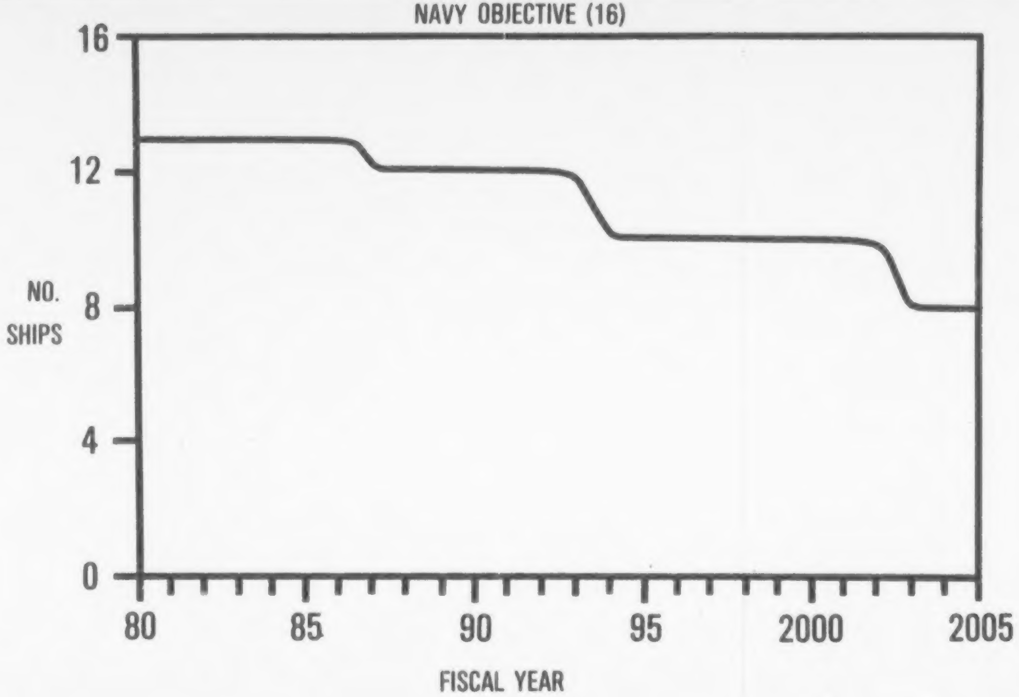
(VG-11)

AMMUNITION SHIPS

(AE/TAE)

(ASSUMING SCN THROUGH FY81)

ACTIVE/NFAF/NRF



(VG-12)

(VG-13) COMBAT STORES SHIPS (AFS/TAF)

From earlier studies which used optimistic basing assumptions the AFS force level was established at seven to meet a wartime commitment. Current Indian Ocean operations have proven that seven AFS's are not sufficient to meet even peacetime three ocean requirements. Therefore, the requirement has now been established at 9 AFS/TAFS. AFS assets will be divided with 4 AFS/ TAFS being assigned to the Atlantic Fleet and the remaining five AFS/TAFS going to the Pacific. To fill the AFS shortfall, the Navy has leased one AFS from the British Royal Fleet Auxiliary (RFA) and hopes to lease a second in late FY-81. Both these ships would be leased with the option to purchase in FY-82. An older TAF not included in this force count resupplies the SIXTHFLT from Norfolk. When it retires a commercial ship will probably have to be chartered.

In summary, an aggressive constuction program is needed to restore the MLSF shortfalls in a 600 ship Navy. In the near term, charter options and selective extensions of service life will need to be pursued pending resolution of the problem. It is again emphasized that the force level objectives discussed here are considered to be minimums.

AMPHIBIOUS FORCES

A key element of U.S. Naval power projection is the amphibious force. The ships of the force are uniquely suited to the demanding task of supporting forcible entry from the sea. The existing Secretary of Defense guidance calls for programming lift capability for a 1.15 notional Marine Amphibious Force (MAF). This programmed level, considering ship non-availability, translates to the ability to lift one notional MAF. We are currently at that level.

However, this lift capability poses problems. First, our peacetime deployment requirements call for maintaining 3 Marine Amphibious Units continously deployed — one in the Mediterranean and two in the western Pacific with a fourth intermittently deployed in the Caribbean or North Atlantic. The Atlantic Fleet can meet its commitment, but both fleets experience higher than desirable deployment ratios. The impending retirement of the LSD 28 class, unless replaced, will exacerbate this shortfall.

(VG-14) The second problem area we face is block obsolescence in the 1990s. Between 1991 and 2002, 7 amphibious assault ships (LPH), 15 amphibious transport dock (LPD), 20 tank landing ships (LST), 5 dock landing ships (LSD-36 Class), 3 amphibious cargo ships (LKA), and the 2 amphibious command ships will reach the end of their service lives. Programming for replacement of these ships as they retire would require significant outlays. Alternatively, by utilizing economy of scale in design of replacement ships, starting an adequate building program now, and selectively extending ships we can maintain our lift capability into the twenty-first century. But, in the context of a 600-ship Navy, the amphibious force should be sized to support simultaneous Marine Amphibious Force and Marine Amphibious Brigade size operations. To accomplish this will require a 1.5 notional MAF-sized amphibious force. The FY 82 amended SCN plan is designed to get a start on this force enhancement.

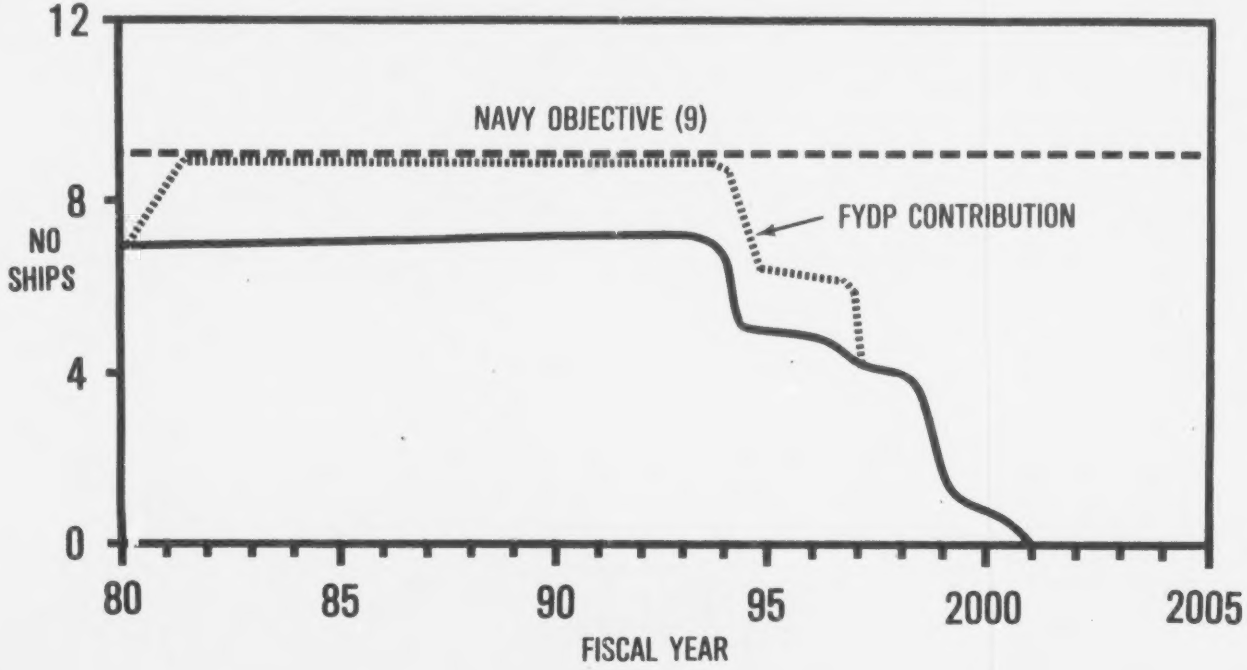
Having recently let the contract for the lead ship of the LSD-41 Class, we propose to build several more in the FYDP period. As our lowest lift capability is in the area of helicopters, we have programmed an LHA for construction in FY 83. In FY 85, we are considering shifting to another type of amphibious aviation ship, the LHDX, which will probably be between an LPH and an LHA in size. As part of the revitalization of the armed forces, the factors used to determine lift (VG-15) requirements for the Marine Corps of the 1990s may be revised. Since amphibious force composition is dictated by the Marine lift requirements, growth in this area will drive the lift characteristics of the LHDX which will replace (VG-16) the LPH in the 1990s. The LCAC will also enter service in the near future.

The FY 82 budget request, as amended, gives us a start on an affordable program to meet the amphibious force requirements of the 1990s and beyond. We are reviewing the requirements and will tailor force levels to provide the requisite capability at the lowest possible cost.

MINE WARFARE FORCES

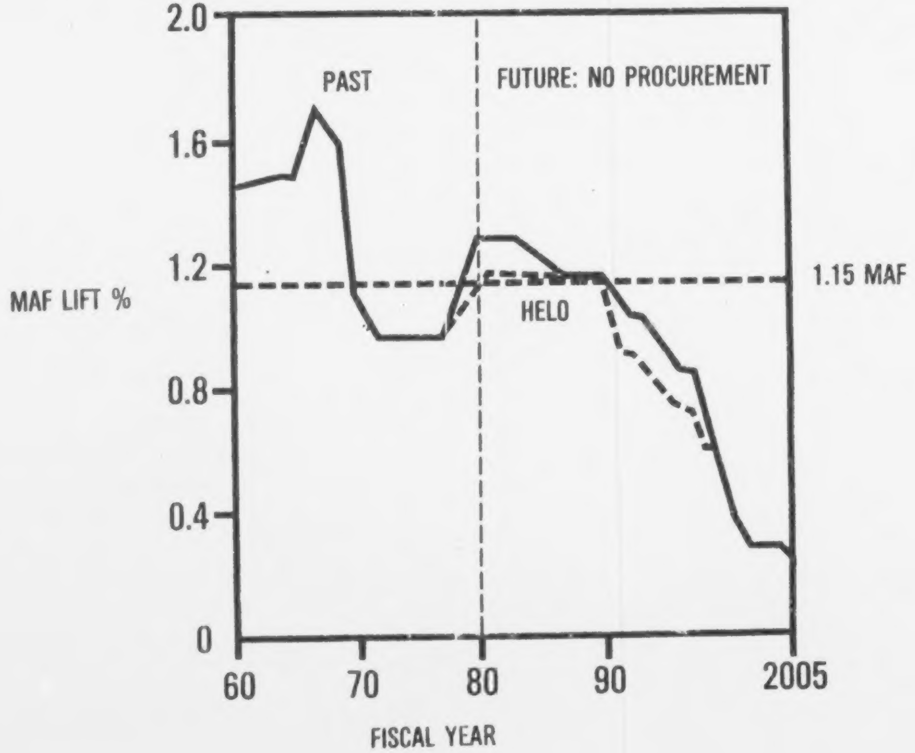
Mine warfare is a potent and highly cost effective method for accomplishing sea denial. The mining of Haiphong is an obvious and recent example of the effectiveness of mine warfare. The Soviet mine inventory and delivery capability are indeed a potent threat to our maritime interests.

COMBAT/STORES SHIPS
AFS/TAFS
(ASSUMING SCN THROUGH FY 81)
ACTIVE/NFAF



(VG-13)

AMPHIBIOUS LIFT



(VG-14)

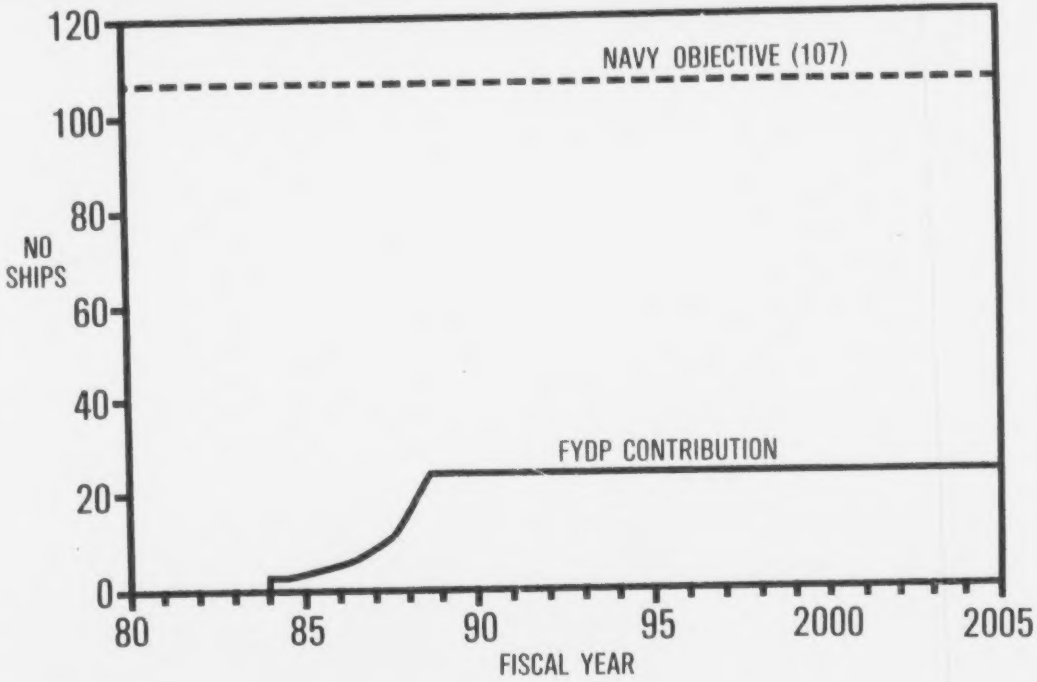
NOTIONAL SHIP CAPABILITY/CHARACTERISTICS

CAPABILITY	LHDX	LPDX	LSD-41	LST-1179
TROOPS	1,800	858	440	386
VEHICLES, K SQ	33.7	15.7	12.8	17.3
CARGO, K CU	60	40.9	5.0	4.1
HELOS, CH-46 SQ	28	6	0	0
BOATS, M-6 EQ./LCAC	12/2	9/2	21/4	0

CHARACTERISTICS				
LENGTH, FT	764	609	609	523
BEAM, FT	106	84	84	70
DISPLACEMENT, TONS	34,570	17,303	15,745	8,400

(VG-15)

LANDING CRAFT AIR CUSHION
LCAC
(1.5 MAF LIFT)
(ASSUMING SCN THROUGH FY 81)



(VG-16)

(VG-17) We have assumed a minimum mine countermeasure surface force level of 31 MCM/MSH ships. Mine clearance operations are anticipated for ports, sea lines of communication, and amphibious assault areas. The present force consists of 22 NRF and 3 active ocean minesweepers (MSO) built during the mid-fifties. We have determined how we can reasonably extend the service life of the MSO class and have concluded that with careful husbanding of those ships in being, plus a suitable building rate for the MCM/MSH ships, we can transform our forces to minimum acceptable levels. A steady, robust constuction rate is absolutely essential to rebuild our surface mine countermeasures capability.

Fiscal Year 1982 Amended Shipbuilding Request

Having reviewed the Navy Force Level requirement I will now discuss what we believe is the direction that must be taken commencing in FY 1982, to attain those forces. In the recent past the practice has been to present shipbuilding budget requests that were relatively austere but which were accompanied by five year shipbuilding plans that indicated an intent to redress shortfalls in (VG-18) the near future. Unfortunately, as you can see on this viewgraph, the outyears of the five year plans never matured. The result is reflected in our inadequate force levels, in the general perception in Congress that the Navy is incapable of articulating its requirements thus forcing the Congress to take the initiative, and also in a declining workforce and shrinking number of dedicated shipbuilding facilities. Congress recognized these problems last year while acting on the FY 1981 Shipbuilding and Conversion Navy (SCN) Appropriation and increased it by some 21 percent over that requested by the President. In doing so the Congress stated that any further reduction in future five year shipbuilding plans would be viewed with great concern. Regardless, the FY-1982 SCN request submitted in January of this year represented a net reduction of 18 percent in constant dollars in comparision with last year's appropriation. The budget year (FY 1982) contains four fewer new construction ships and for the Fiscal Year 1982-86 this years Five Year Shipbuilding Program contains 20 fewer new construction ships then in last years Five Year Plan. Clearly then, the original FY 1982 request is inadequate.

The amended FY-1982 request submitted to the Congress this month by President Reagan represents a reversal of the trend of the last few years vis-a-vis shipbuilding. We have again looked at our requirements; not in respect to fiscal constraints but rather in light of the mission of the Navy. As a result of this reassessment a shipbuilding program has been developed that satisfies these requirements as soon as feasible. It is constrained only by current capacity of the shipbuilding industry and by prudent procurement practices. The later is particularly important since we must avoid precipitous procurement practices that might result in claim situations such as we experienced in the 1970's.

With that background I will present an overview of our budget request for FY 1982 discussing each building program.

GENERAL

The FY 1982 request as amended is for $10.3 billion which will fund 18 new construction ships and 10 conversions, 2 reactivations and provide for 3 acquisitions. This is an increase of 3.7 billion over the original FY 1982 request, a (VG-19) 55 percent increase. This viewgraph summarizes the programs that are affected by the amended request. The costs required to execute the programs are of course dependent on approval of the FY 1981 SCN Supplemental request.

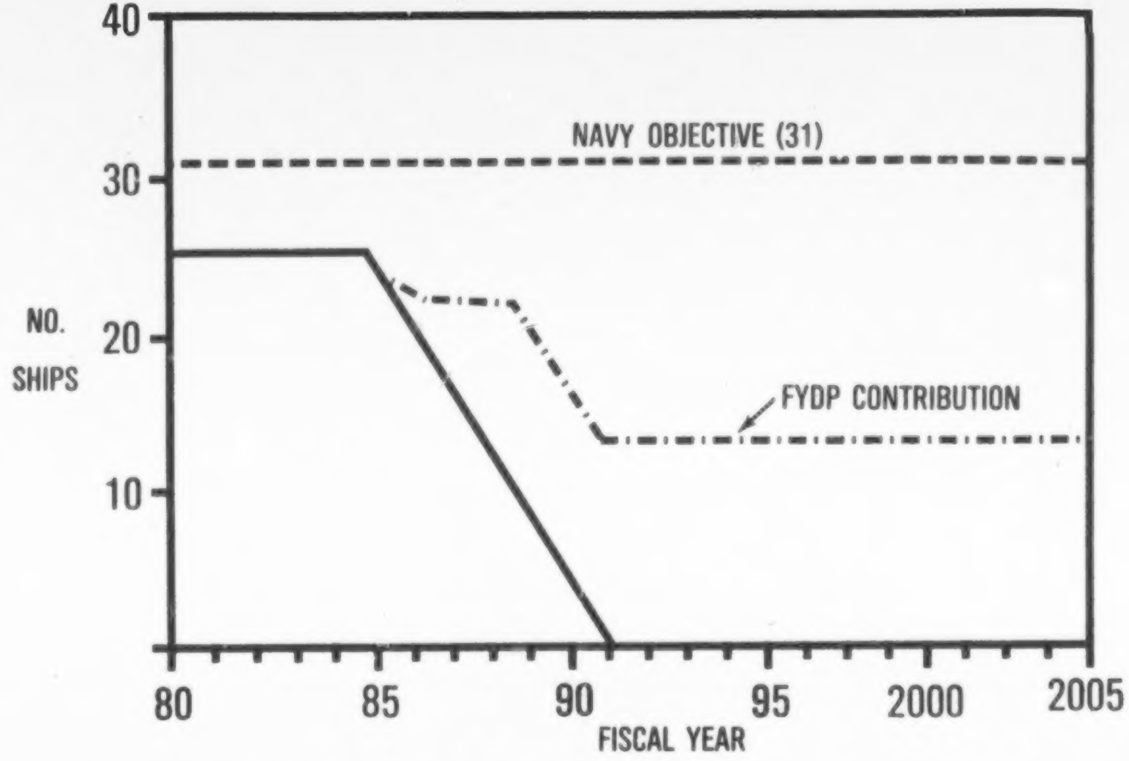
TRIDENT-SSBN

In the strategic warfare area our program continues the TRIDENT Nuclear Powered Fleet Ballistic Missile Submarine construction initiated in FY 1974. Nine TRIDENT Submarines have already been authorized and funded through FY 1981. The proposed building rate represents the minimum construction level required to provide for orderly replacement of existing Polaris and Poseidon Submarines, the oldest of which will have been in service 22 years by the time the lead (VG-21) TRIDENT is delivered. Funds requested for this program include those required for the FY 1982 ship and advance procurement for the FY 1983 and 84 ships.

ATTACK SUBMARINE-SSN-688

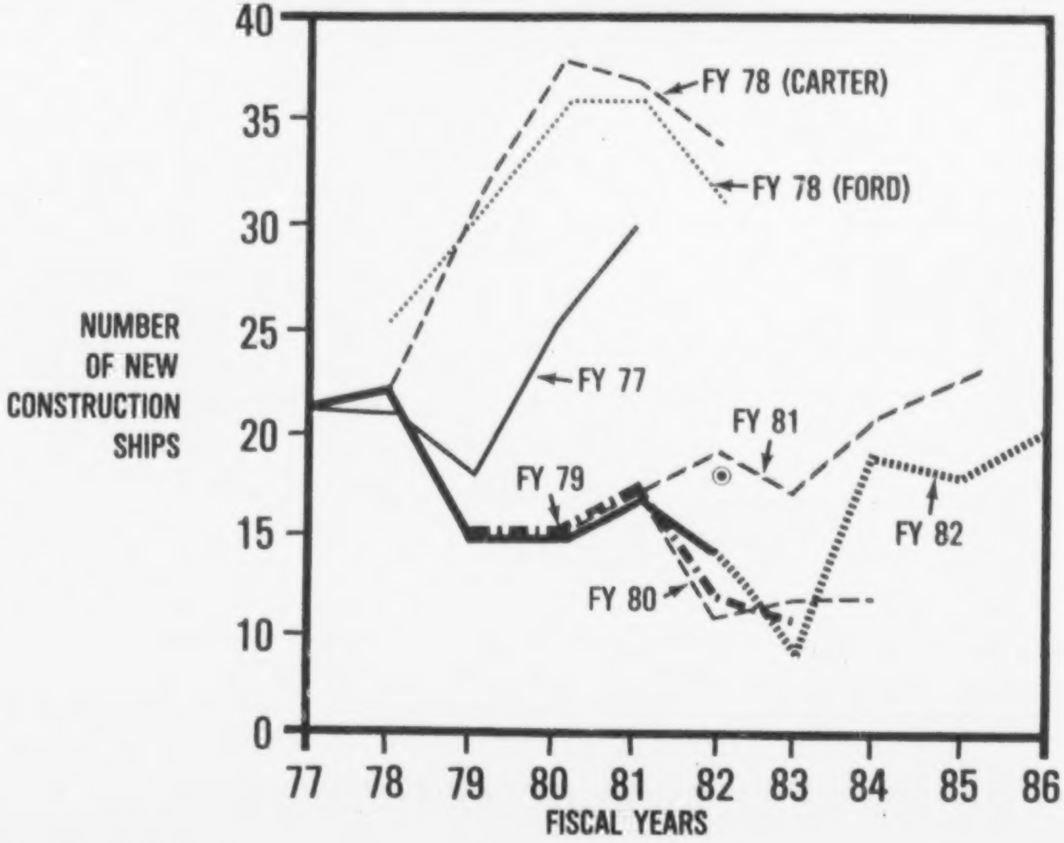
Another key element in our fleet is the Attack Submarine. Previous budget requests have supported neither sufficient ships to maintain force level requirements nor an adequate shipbuilding and vendor base. In FY 1980 and 81 the Congress recognized this and authorized and appropriated additional ships each (VG-23) year. The FY 1982 amended request is for two ships with sufficient advance procurement funds for three follow on ships in the outyears. Addition-

MINE COUNTERMEASURES SHIPS
(ASSUMING SCN THROUGH FY 81)



(VG-17)

FIVE YEAR PLANS



(VG-18)

FY 1982 BUDGET
SHIPBUILDING AND CONVERSION NAVY (SCN)
($ IN MILLIONS)

	JANUARY REQUEST NO	JANUARY REQUEST NET FUNDING REQUIREMENT	AMENDED REQUEST NO	AMENDED REQUEST NET FUNDING REQUIREMENT
TRIDENT (SSBN)	1	1329.7	1	1291.5
ATTACK SUBMARINE (SSN-668)	1	576.7	2	1227.0
AIRCRAFT CARRIER (CVN)		–		658.0
CARRIER SLEP (CV SLEP)		100.8		100.8
AIRCRAFT CARRIER (CV)		–	1	364.0
GUIDED MISSILE CRUISER (CG-47)	2	2136.4	3	2946.3
BATTLESHIP (BB)		–	1	246.0
GUIDED MISSILE FRIGATE (FFG-7)	1	498.9	3	971.9
LANDING SHIP DOCK (LSD)		–		34.0
MINE COUNTERMEASURES SHIP (MCM)	1	100.6	1	99.7
SALVAGE SHIP (ARS)	2	160.5	2	160.5
FLEET OILER (TAO)	1	204.0	1	200.0
HOSPITAL SHIP (TAH)		10.0		10.0
COMBAT STORES SHIP (TAFS)	1	20.0	2	37.0
OCEAN SURVEILLANCE SHIP (TAGOS)	4	159.0	4	156.5
AUXILIARY LIGHTERAGE SHIP (TALS)		–	1	54.0
MARITIME PREPOSITIONING SHIP (TAKX)	2	336.0	3	392.0
FAST LOGISTIC SHIP (TAKRX)	2	216.4	8	668.4
CRAFT		141.8		141.0
OUTFITTING/POST DELIVERY		222.3		219.5
COST GROWTH		66.0		88.0
ESCALATION		360.5		224.0
		TOTAL 6,639.6		10,290.1
TOTAL SHIPS	18*		33**	

* INCLUDES 4 ACQUISITIONS/CONVERSIONS

* * INCLUDES 15 ACQUISITIONS/CONVERSIONS/REACTIVATIONS

TRIDENT
FLEET BALLISTIC MISSILE SUBMARINE

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	1	1
COST	$1174.9	$1268.6
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS	-149.2	-207.8
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS	38.0	230.7
NET FUNDING REQUIREMENT	$1063.7M	$1291.5M

(VG-21)

SSN 688 CLASS NUCLEAR POWERED ATTACK SUBMARINE

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	2	2
COST	$909.7	+$1163.5
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS	-111.2	- 150.4
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS	188.8	+ 213.9
NET FUNDING REQUIREMENT	$987.3M	$1227.0M

(VG-23)

ally, this request includes $85.0 million for installation of a improved cruise missile launch capability in FY 1982 ships. This is a very significant characteristics change which will provide a new dimension to the combat capability of the 688 class. Backfit of the FY 1980 and 81 ships is also planned. The cost growth line item of this year's budget will fund the FY 1980 backfits.

AIRCRAFT CARRIER (NUCLEAR POWERED)-CVN

Funds are requested for long lead procurement of CVN-72, planned for FY 1983. As I stated earlier, the ship would be for replacement of existing ships. (VG-25) The funds requested are for equipment to be purchased on a lead time from need basis. These funds are needed now because there is only one shipbuilder capable of constructing a CVN and there is a very limited nuclear vendor base; therefore, scheduling flexibility is severely restricted.

AIRCRAFT CARRIER SERVICE LIFE EXTENSION PROGRAM-CV SLEP

The SLEP program was developed to extend the service lives of the eight conventionally powered Forrestal and Kitty Hawk class carriers. FY 1981 marked the commencement of the first Carrier Service Life Extension Program (SLEP) conversion when USS Saratoga entered the Philadelphia Naval Shipyard in October 1980 for 28 months. The SLEP of USS Saratoga will extend her service live for 15 years beyond the current expected service live of 30 years. Based on current prices, SLEP will provide 15 years of carrier life at roughly 40 percent the cost (VG-27) associated with new construction of a similar large deck carrier. Funds requested in FY 1982 are for advance procurement supporting the FY 1983 commencement of the USS Forrestal SLEP.

AIRCRAFT CARRIER REACTIVATION-CV (REACTIVATION)

(VG-29) Earlier I discussed the reactivation of USS Oriskany (CV-34). Funds requested in FY 1982 are in addition to the $139 million requested in the FY 1981 supplemental. It is estimated that reactivation will require 34 months to complete which would include some modernization of equipment and installation of a steel flight deck, replacing the current wooden deck. The Congress authorized reactivation of USS Oriskany in FY 1981 however, funds were not appropriated. This request is a follow up to that Congressional action on the FY 1981 Authorization Act.

GUIDED MISSILE CRUISER-CG-47

The FY 1982 request includes the CG'S-51 through 53, the fifth, sixth and seventh ships of the CG-47 Guided Missile Cruiser class. The first ship of this class was authorized and funded in the FY 1978 budget.

The AEGIS system installed in the CG-47 Class is an advanced anti-air warfare system designed to counter the anti-ship missile threat of the 1980'S and beyond. It provides area air defense in a high-density, high-threat, anti-ship missile enviornment. Our reexamination of Soviet missile-launching capabilities confirms that CG-47 Class Ships are urgently required in the fleet in numbers.

During the development of AEGIS the space and weight requirements for installation aboard ship have been reduced to the point where the system can be accomodated in the proven hull of the Spruance Class Destroyer. This has reduced costs. In addition to a quantum improvement in anti-air warfare, the AEGIS CG-47 class has superior capabilities in anti-submarine, anti-surface ship warfare, and improved passive protection. CG-47 Class Ships will operate as an essential component of battle groups formed around our aircraft carriers, and will enhance the battle group's ability to fight and survive in the most hostile environment.

(VG-31) The funding requirement for the CG-47 Class in FY 1982 is $2946.3 million. This includes vertical launch systems for the second and third CG-47 Class Ships in this years program. It is envisioned that in addition to these two ships, all follow on CG-47 Class Ships will be equipped with vertical launchers vice MK-26 launchers for storing and launching several types of missiles.

Congress appropriated $131 million in FY 1981 for advance procurement of long lead materials for the FY 1982 building program. Due to higher than expected inflation rates associated with Government Furnished Equipment (GFE) and some cost growth, the previous Administration directed reprogramming of the advance procurement funds to meet these costs. A reprogramming request is being processed to reflect this. The new Administration's FY 1981 Supplemental requests an additional $129 million to restore the advance procurement funds. The FY 1982 funding request assumes favorable consideration of that request.

CVN - NUCLEAR CARRIER

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS		0
COST		
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS		$658.0
NET FUNDING REQUIREMENT $		**$658.0M**

(VG-25)

CARRIER SERVICE LIFE EXTENSION
(CV SLEP)

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	1	0
COST	$526.6	0
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS	-106.2	0
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS	81.0	$100.8
NET FUNDING REQUIREMENT	$501.4M	$100.8M

(VG-27)

CV REACTIVATION

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS		1
COST		$503.0
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		-$139.0
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS (SUPPLEMENTAL)	$139.0	
NET FUNDING REQUIREMENT	**$ 139.0M**	**$364.0M**

(VG-29)

GUIDED MISSILE CRUISER - (CG-47 CLASS)

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	2	3
COST	$1789.6	$3054.6
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS	0	– 129.0
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS	129.0	20.7
NET FUNDING REQUIREMENT	$1918.6M	$ 2946.3

(VG-31)

BATTLESHIP-BB (REACTIVATION)

The FY 1982 request contains funds for reactivation ot the USS New Jersey. Again, this is a follow up on Congressional authorization of the reactivation in the FY 1981 Authorization Act. Returning New Jersey to active service is a near term proposal to improve naval posture but it is neither a substitute for nor a competitor with other initiatives planned for building up the Navy's force structure. The survivability features already built into this class ship, when combined with new offensive capabilities such as cruise missiles, make the Iowa Class (VG-33) Battleship a formidable weapons system. Funds requested in FY 1982, when combined with those contained in the FY 1981 Supplemental, would provide for reactivation/ modernization of New Jersey and procurement of long lead materials for reactivation of USS Iowa in FY 1983.

GUIDED MISSILE FRIGATE-FFG

(VG-35) The Fiscal Year 1982 budget request continues the procurement of the FFG-7 Class Frigates with three more ships and a funding requirement of $971.9 million. This is a continuation of an ongoing program which was first funded in Fiscal Year 1973. The FFG-7 Class is designed as a modest capability, lower cost ship to serve in roles where those capabilities are sufficient. Frigates are intended to accompany amphibious forces, underway replenishment groups, and military and mercantile convoys in order to provide protection against air, surface, and subsurface threats.

The FFG-7 Class Frigate is equipped with a general purpose missile launcher which can fire the HARPOON Surface-to-Surface Missile for offensive operations against surface ships as well as the SM-1 short range missile against aircraft and missile targets. Anti-submarine warfare equipment will include the long-range Towed Array Detection System, TACTAS--for tactical towed array sonar, backed up by a hull-mounted sonar and two helicopters for long-range detection and torpedo attack against submarines. Other armament includes a 76MM dual-purpose NATO standard gun, a rapid-fire close-in point defense weapons system, and anti-submarine torpedoes. Its survivability is equal to or better than existing Frigates.

Forty-Five FFG-7 Class Ships have previously been authorized, including six in the Fiscal Year 1981 budget. The lead ship, the USS Oliver Hazard Perry, was commissioned three years ago and has completed its first successful deployment with the sixth fleet during the pass year. Nine ships have been delivered to date and five more are scheduled to be completed this fiscal year.

LANDING SHIP DOCK-LSD (ADVANCE PROCUREMENT)

(VG-37) The Congress appropriated $47 million in advance procurement funds in FY 1981 for the second ship of this class. Urgent requirements in other programs experiencing cost growth resulted in identification of the FY 1981 advance procurement funds as an appropriate a source. As in the case of the CG-47 advance procurement, a reprogramming request to reflect this is being processed. Although the Five Year Shipbuilding Plan sumbitted in January does not contain any follow on LSD-41 Class ships the amended request for FY 1983 does add one ship in FY 1983; therefore, advance procurement funds of $34 million are requested in the amended FY 1982 request. In order to support 1.5 MAF lift a total of nine ships of this class is urgently needed to replace the existing LSD-28 Class which will reach end of service life in the mid 1980'S. Procurement of this class of ship will enable us to begin the first phase of the modernization of amphibious forces which face block obsolescence beginning in the early 1990'S. The LSD-41 Class Ship will also provide capability to lift the Landing Craft Air Cushion vehicles (LCAC), a significantly advanced assault craft. The first three LCAC are also contained in the FY 1982 SCN request. The introduction of LCAC to the amphibious force will cause a significant jump in our ability to transport heavy equipment to many more beaches world wide, at high speeds and with a commensurate reduction in vulnerability while in transit.

MINE COUNTERMEASURES SHIP-MCM

The FY 1982 Shipbuilding budget request contains funds for the lead ship of a new class of low mix Mine Countermeasure Ships. Currently we have complementary surface and airborne platforms and systems however, the ships are more than 25 years of age. It is planned to extend their service live until 1991. Therefore, we have a requirement to proceed with a building program that will replace these aging ships while also upgrading capability. These low-mix MCM ships will be capable of maximizing shipboard performance with low life cycle and procurement costs. The command and control suite will be state-of-the-are; capable of automatically integrating, processing and simultaneously displaying data from all ships sensors; capable of storing and retrieving data for use by own ships and

BATTLESHIP BB REACTIVATION

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS		1
COST		$247.0
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		−89.0
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS (SUPPLEMENTAL)	$89.0	+88.0
NET FUNDING REQUIREMENT $	89.0M	$246.0M

(VG-33)

GUIDED MISSILE FRIGATE - FFG 7 CLASS

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	6	3
COST	$1506.7	$971.9
LESS ADVANCE PROCUREMENT FROM PRIOR YEAR	0	0
PLUS ADVANCE PROCUREMENT FOR FUTURE YEAR	0	0
NET FUNDING REQUIREMENT	$1506.7M	$971.9M

LANDING SHIP DOCK
LSD-41 CLASS

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	1	0
COST	$340.7	
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS	—	
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS	+ 37.8	$34.0
NET FUNDING REQUIREMENT	**$378.5M**	**$34.0M**

(VG-37)

other fleet units for channel conditioning, mine hunting, neutralization and mechanical minesweeping operations. It is planned to construct 14 ships of this class to be followed by the introcuction of another class of minehunters midway (VG-39) through the five year period. $99.7 million is requested in this budget for the lead ship.

SALVAGE SHIP-ARS

The FY 82 building request contains funds for two follow on new construction salvage ships. The Salvage Ship (ARS) is basically a repeat design of the existing ARS-38 Class, updated to state of the art equipments, current habitability and environmental standards. It will also outperform existing salvage ships. (VG-41) A total of five ships is planned. $160.5 million is requested for this program.

FLEET OILER-TAO

The FY 1982 budget request contains the lead ship of a new class of Fleet Oiler that will be built to commercial specifications and manned by a civilian MSC crew. This class ship is a follow on to the AO-177 Class Ships of which five were authorized by the Congress in FY 1978 and prior. The TAO's have a capacity 50 percent greater than the AO-177 Class and therefore will be somewhat larger in size. In reviewing force level requirements earlier in my statement I pointed out that the Mobile Logistic Support Force ships urgently require both replacements for aging ships and addition to enable our battle groups to fulfill mission requirements. Over 20 ships of this class will be programmed in the follow on (VG-43) years. $200.0 million is required in FY 1982 for the lead TAO.

HOSPITAL SHIP-TAH (CONVERSION)

An urgent requirement exists for a hospital ship to be employed in conjunction with the Rapid Deployment Force (RDF). The Defense Department has examined various alteratives to satisfy this requirement and after exhaustive study, the SS United States was selected as an appropriate candidate for conversion. It is currently envisioned to provide a 1,600 bed, 19 operating room capability in a reserve status (reduced operating), manned by a Military Sealift Command (MSC) caretaker crew to the extent necessary to be ready for sea on five days notice. (VG-45) $10.0 million is requested in FY 1982 for advance procurement of long lead items of equipment with reactivation and conversion planned for FY 1983.

COMBAT STORES SHIP-TAFS (ACQUISITION)

Expansion of U. S. Navy operations into the Indian Ocean/Persian Gulf area has (VG-47) highlighted the parlous state of the Mobile Logistic Support Force. In FY 1982, we are requesting $37.0M to purchase two stores ships from the Royal Fleet Auxiliary of the Royal Navy. The first of these ships, USNS Sirius, is currently under charter to the Military Sealift Command and will deploy this spring to the Sixth Fleet. The seven AFS ships plus one TAF currently in the Navy inventory are inadequate to support Atlantic, Mediteranean, Pacific and Indian Ocean/Persian Gulf commitments. The immediate availability of USNS Sirius (ex, RFA Lyness) and RFA Tarbatness, the second desired acquisition, will permit required support, for our three ocean commitments with a reasonable peacetime rotation. If Navy were to request authorization to construct two new AFS in liew of these acquisitions, the costs would be over $400M each in FY 1982 dollars and they would not be available for fleet support until 1987. We recognize the impact on U. S. Shipbuilders of offshore procurement, but the urgency of this requirement and a most favorable price makes them very very attractive despite this impact. There are no alternatives under the U. S. flag at this time. In addition, our forthcoming programs to build up the U. S. Navy will provide adequate employment for the entire U. S. Shipbuilding Industry.

OCEAN SURVEILLANCE SHIP-TAGOS

The four Auxiliary Ocean Surveillance Ships, TAGOS, requested in this year's budget are a continuation of the acquisition program started in FY 1979. (VG-49) The ships are needed to support the mission requirements of the Surveillance Towed Array Sensor system--or SURTASS.

The FY 1982 budget contains a request of $156.5M for four follow on TAGOS ships. The SURTASS/TAGOS system is a dedicated ship/sensor combination designed to collect and process undersea acqustic data. The system includes a small MSC manned ship, designated TAGOS, pulling a long passive linear hydrophone array called SURTASS. The system is capable of operating in international waters world-wide. After some preliminary shipboard processing, the acoustic data will be relayed via satellite to a shore facility for futher processing, display, and integration with other surveillance data.

MINE COUNTERMEASURES SHIP- (MCM)

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	0	1
COST	$0	$ 99.7
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS	0	0
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS	0	0
NET FUNDING REQUIREMENT	$ 0	$ 99.7M

(VG-39)

SALVAGE SHIP-ARS

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	1	2
COST	$92.1	$160.5
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS		
NET FUNDING REQUIREMENT	$ 92.1M	$160.5M

(VG-41)

FLEET OILER - (TAO)

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	0	1
COST	$0	$200.0
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS	0	0
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS	0	0
NET FUNDING REQUIREMENT	$0	$200.0M

(VG-43)

HOSPITAL SHIP - TAH (CONVERSION)

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS		
COST		
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS		$10.0
NET FUNDING REQUIREMENT $		**$10.0M**

(VG-45)

COMBAT STORES SHIP
TAFS (ACQUISITION)

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS		2
COST		$37.0
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS		
NET FUNDING REQUIREMENT $	—	$37.0M

(VG-47)

OCEAN SURVEILLANCE SHIP
(TAGOS)

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	5	4
COST	$178.7	$156.5
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS	0	0
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS	0	0
NET FUNDING REQUIREMENT	$178.7M	$156.5M

(VG-49)

TAGOS/SURTASS is a relatively low cost but vital system which will significantly increase coverage and provide valuable back up to other undersea surveillance systems. Specifically, its mobility and flexibility will provide surveillance in those areas that are not or cannot be covered by existing acoustic surveillance systems.

Navy requires a minimum of eighteen TAGOS. Two TAGOS were appropriated in FY 1979, one in the FY 1980 budget and five in FY 1981. In acting on the FY 1980 Appropriations Act the House Appropriations Committee directed that a contract not be awarded until the Committee was notified that Operational Evaluation (OPEVAL) had been successfully completed. The program underwent a restructuring in 1978 and testing conducted in 1979 verified that array and software deficiencies had been corrected. Contracts for the first three ships were awarded in September 1980.

AUXILIARY LIGHTERAGE SHIP-TALS (ACQUISITION)

(VG-51) This years budget request includes the acquisition through purchase of one "SEABEE" Barge Carrier from commercial operations. This ship would provide a much needed heavy lift capability to the RDF. Its principal role would be to transport significant amounts of lighterage (barges) needed for the ship-to-shore movement of cargo and equipment in undeveloped areas from the other ships of the Maritime Prepositioning Force or from Fast Logistic Ships. Thus, the ship provides great flexibility to operational planners since this capability, organic to the Maritime Prepositioning Ship Force, or deployed with the Fast Logistic Ships, gives the on-scene commander a much wider selection of landing areas.

MARITIME PREPOSITIONING SHIPS-TAKX

In FY 1981, Congress appropriated $33.0M in long lead procurement funds for (VG-53) construction of the lead TAKX Maritime Prepositioning Ship. The FY 1982 (VG-54) budget requests $195.0M for the remaining costs of that ship. In addition THE FY 1982 budget requests $197.0M for the conversion of two existing U. S. Flag Roll On/Roll Off ships to that configuration required to support the Rapid Deployment Force.

FAST LOGISTIC SHIP-TAKRX (CONVERSION)

(VG-56) The FY 1982 budget requests $668.4M to permit acquisition of two and conversion of eight SL-7 Container Ships. Six ships will be purchased with the $285.0M appropriated for that purpose in FY 1981. These ships will be manned by civilian mariners of the Military Sealift Command and maintained in Reduced Operating Status (ROS) in the Continental United States ready to deploy on five days notice.

(VG-57)

CRAFT

The FY 1982 Craft request includes funding for seven separate programs. Foremost of these programs is the Landing Craft Air Cushion (LCAC). This innovative high technology craft provides a quantum improvement in the ship to shore movement of Marine Corps personnel and equipment. The LCAC has been submitted to the most rigorous competitive testing process. The production model will combine the best features of both competitors which gives assurance of high success. The LCAC has been developed in tandem with the LSD-41 class to ensure compatibility and maximize operational success. Three craft are requested in this budget.

In addition, the craft request provides for 27 Landing Craft Personnel (Large), or LCPL, which will be assigned to amphibious ships and used as amphibious wave command and control boats. In order to upgrade the surveillance, reconnaissance, rescue and evacuation mission capability, the request also includes ten Special Warfare Craft (Light), SWCL, to be operated by Underwater Demolition Teams (UDT) and Sea, Air Land Teams, (SEAL). In support of Maritime Propositioning ships, this years request also includes ten Landing Craft Medium (LCM).

Also included are four Personnel Living Barges (YRBM) for use in shipyards by personnel who are displaced from their ships during overhaul but who must remain nearby for security, propulsion and electronic testing requirements. Additionally, the request provides for three Cargo Barges (YC) and one Floating Crane (YD) which are required for the orderly replacement of overage units.

(VG-58)

OUTFITTING/POST DELIVERY

The FY 1982 request includes $73.0M for the outfitting of new ships. Funds required for the post delivery correction of construction and acceptance trial deficiencies in new ships total $146.5 million.

AUXILIARY LIGHTERAGE SHIPS
TALS (ACQUISITION)

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS		1
COST		$54.0
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS		
NET FUNDING REQUIREMENT $	—	$54.0M

(VG-51)

MARITIME PREPOSITIONING SHIP
TAKX
NEW CONSTRUCTION

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS	—	1
COST		$248.0
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		- $53.0
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS	$53.0	
NET FUNDING REQUIREMENT	$53.0 M	$195.0M

(VG-53)

MARITIME PREPOSITIONING SHIP
TAKX (C)
CONVERSION

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS		2
COST (MISC)	$7.6	$197.0
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS		
NET FUNDING REQUIREMENT	$7.6M	$197.0M

(VG-54)

FAST LOGISTIC SHIP
TAKRX (C)
CONVERSION

	FY 1981	FY 1982 AMENDED
NUMBER OF SHIPS		8
COST	* $257.4	$668.4 * *
LESS ADVANCE PROCUREMENT FROM PRIOR YEARS		
PLUS ADVANCE PROCUREMENT FOR FUTURE YEARS		
NET FUNDING REQUIREMENT	$257.4 M	$668.4M

* ACQUISITION OF 6 SHIPS

* * ACQUISITION OF 2 SHIPS
CONVERSION OF 8 SHIPS

(VG-56)

CRAFT
FY 82 AMENDED

	QUANTITY	COST
LANDING CRAFT PERSONNEL (LARGE) (LCPL)	27	$4.8M
LANDING CRAFT (MEDIUM) (LCM)	10	$8.3M
SPECIAL WARFARE CRAFT (LIGHT) (SWCL)	16	$9.4M
LANDING CRAFT AIR CUSHION (LCAC)	3	$76.1M
LIVING BARGE (YRBM)	4	$36.5M
FLOATING CRANE (YD)	1	$4.4M
CARGO BARGE (YC)	3	$1.5M
TOTAL		$141.0M

OTHER SHIPBUILDING
($IN MILLIONS)

	FY1981	FY1982 AMENDED
OUTFITTING	$ 81.5M	$ 73.0M
POST DELIVERY	142.3M	146.5M
COST GROWTH	—	88.0M
ESCALATION	$268.8M	$224.0M

(VG-58)

COST GROWTH/ESCALATION

Of the total $312.0M requested in the FY 1982 budget, $224.0M is for escalation on prior year programs due to higher inflation rates on basic construction contracts than predicted in prior year indices. The remainder includes two vital additions to capability, Backfit of the Vertical Launching System on SSN's authorized in FY 1980 ($40.0M) and upgrade of NTDS capability in the CVN-71 ($22.0M). The remainder, $26.0M, is for coverage of additional government liability under Public Law 85-804 Claims Settlement of July 1978 on FY 1973/74 SSN-688 Submarines being built by Electric Boat Company.

Mr. Chairman, that completes my overview of the FY 1982 Amended Shipbuilding Program. It is a matter of personal pride that I have been given the opportunity, with others, to work with your Committee to bring the U. S. Navy back toward a position of preeminence on the worlds oceans. It will not be an easy task, - threr is no royal road - and our dedication to succeed must be strong enough to withstand the assault of those who decry the need for increased defense.

The Navy needs these ships to carry out its growing worldwide commitments and this maritime nation needs a Navy on which it can rely to keep our sea lanes free and clear.

The industrial base of this great nation appears ready to support us. As we look downstream to increased building programs, I see less flexibility to dictate building yard location based on local economic factors and a requirement to carefully fit yards to program which will optimize our national capacity. Attainment and maintenance of a properly sized U. S. Navy will provide full and expanding employment to our nation's shipbuilders for years to come.

Historically, this Committee has consistently been a strong supporter of a strong Navy. I elicit your continued support. Thank you.

BIOGRAPHICAL SKETCH

VICE ADMIRAL WILLIAM H. ROWDEN, U.S. NAVY

Vice Admiral William H. Rowden was born in Woodsville, New Hampshire, on 12 May 1930. He attended the U.S. Naval Academy, graduating with the Class of 1952. Subsequent to graduation, he was assigned in the Gunnery Department of USS YARNALL (DD 541), a Fletcher class destroyer, operating with SEVENTH Fleet in support of UN actions in Korea.

In late 1954 he became Executive Officer of the Long Beach based coastal minesweeper, USS CORMORANT (MSC 122). He took command of CORMORANT in December 1955, sailed her to her new homeport in Sasebo, Japan, in January 1956, and remained as CO for the succeeding eighteen months.

Following a tour in the Bureau of Naval Personnel as an Enlisted Detailer, he served as Executive Officer in USS LESTER (DE 1022), a Newport, Rhode Island-based Dealey class destroyer escort. In 1959, Vice Admiral Rowden attended the U.S. Naval Postgraduate School in Monterey, California, where he earned a Bachelor of Science Degree in Ordnance Engineering in 1961. A tour as Commanding Officer, USS BAUER (DE 1025) followed. He was deployed in BAUER with units of the SEVENTH Fleet, in the South China Sea, at the beginning of the Navy's involvement in the Vietnam conflict.

In 1965, he was assigned as Personal Aide to Commander in Chief Pacific, Admiral U.S.G. Sharp, USN, and served in that capacity until 1967. After a 6-month tour as a student at the Armed Forces Staff College, Norfolk, Virginia, Vice Admiral Rowden became Commanding Officer of USS LYNDE McCORMICK (DDG 8). While in McCORMICK, he served a tour with the U.S. SEVENTH Fleet in support of U.S. combat operations in Southeast Asia. Prior to reporting as Commanding Officer, USS COLUMBUS (CG 12) in August 1973, he was assigned to the Surface Missile Systems Project in the Naval Ordnance Systems Command and the Anti-Ship Missile Defense Project in the Naval Material Command. Upon being relieved of command of COLUMBUS in August 1974, he reported to the Surface Weapons Systems Division (OP-35) in the Office of the Chief of Naval Operations as Deputy Director in September 1974. Subsequent to this assignment, Vice Admiral Rowden reported to the Combat Direction Systems Division (OP-34), Office of the Chief of Naval Operations, as Director in March 1975. In June 1976, Vice Admiral Rowden became Director, Surface Combat Systems Division (OP-35), Office of the Chief of Naval Operations. Vice Admiral Rowden assumed command of Cruiser-Destroyer Group THREE on 23 July 1977. He was relieved as Commander Cruiser-Destroyer Group THREE on 11 May 1979 and on 18 June 1979 he became Assistant Deputy Chief of Naval Operations (Surface Warfare).

On 1 September 1980, Vice Admiral Rowden relieved as Deputy Chief of Naval Operations (Surface Warfare).

PREPARED STATEMENT OF VICE ADM. EARL B. FOWLER, JR., USN

COMMANDER, NAVAL SEA SYSTEMS COMMAND

Mr. Chairman and Members of the Committee. I am Vice Admiral Earl B. Fowler, Commander, Naval Sea Systems Command.

It is a pleasure to appear before you today to discuss shipbuilding and shipyards.

If it meets with your approval, Mr. Chairman, I will use some information charts to assist me in the presentation, and following the presentation, I will address any questions you may have.

SHIPBUILDING AND SHIPYARDS

o STATUS REPORT OF THE CURRENT PROGRAM

oo SCHEDULE
oo SUBMARINES
oo FINANCIAL

o FY 1982 FIVE YEAR SHIPBUILDING PROGRAM AS AMENDED
o RESOURCES AVAILABLE TO PERFORM WORK IN PRIVATE SHIPYARDS

o SUMMARY

CHART 1

This first chart contains an outline of the specific areas that I intend to cover. I will present the status of the current shipbuilding program with some specific emphasis on the TRIDENT and SSN 688 Class submarines construction. I will cover the projected shipbuilding plan and the resources available to perform the work in public and private yards. This item on our agenda will cover the industry workload forecast.

NEW CONSTRUCTION SHIPS UNDER CONTRACT
AS OF 1 MARCH 1981

SHIP TYPE	QTY	SHIPYARD
AIRCRAFT CARRIER (CVN)	2	NEWPORT NEWS
GUIDED MISSILE DESTROYER (DDG-993 CLASS)	4	INGALLS
GUIDED MISSILE CRUISER (AEGIS) (CG)	2	INGALLS
DESTROYERS (DD)	1	INGALLS
LANDING SHIP DOCK (LSD)	1	LOCKHEED
GUIDED MISSILE FRIGATE (FFG)	30	BATH, TODD, LA AND TODD, SEATTLE
PATROL COMBATANT MISSILE (PHM)	5	BOEING MARINE
DESTROYER TENDER (AD)	3	NATIONAL STEEL
FLEET OILER (AO)	4	AVONDALE
CABLE REPAIR SHIP (T-ARC)	1	NATIONAL STEEL
SUBMARINE TENDER (AS)	1	LOCKHEED
OCEAN SURVEILLANCE (T-AGOS)	8	TACOMA BOAT
FLEET OCEAN TUG (T-ATF)	2	MARINETTE MARINE
FLEET BALLISTIC MISSILE SUBMARINE (SSBN)	8	ELECTRIC BOAT
ATTACK SUBMARINE (SSN-688 CLASS)	22	ELECTRIC BOAD/NEWPORT NEWS
	94	

CHART 2

As of March of this year, the Navy had under construction contract a total of 94 ships.

COMPARATIVE DELIVERY ASSESSMENT

COMPARATIVE DELIVERY ASSESSMENT (4-1-81)

	EARLIER	LATER	NO CHANGE
2 AIRCRAFT CARRIER (CVN)			2
4 GUIDED MISSILE DESTROYER (DDG-993 CLASS)		3	1
2 GUIDED MISSILE CRUISER (AEGIS) (CG)			2
1 DESTROYERS (DD)			1
1 LANDING SHIP DOCK (LSD)			1
30 GUIDED MISSILE FRIGATE (FFG)	9	11	10
5 PATROL COMBATANT MISSILE (PHM)		5	
3 DESTROYER TENDER (AD)		1	2
4 FLEET OILER (AO)		4	
1 CABLE REPAIR SHIP (T-ARC)		1	
1 SUBMARINE TENDER (AS)	1		
8 OCEAN SURVEILLANCE (T-AGOS)			8
2 FLEET OCEAN TUG (T-ATF)		2	
8 FLEET BALLISTIC MISSILE SUBMARINE (SSBN)		7	1
22 ATTACK SUBMARINE (SSN-688 CLASS)	—	20	2
94 TOTAL	10	54	30

CHART 3

This chart shows the ships under construction and their delivery status compared to delivery assessments made early last year. Ten are earlier, 54 later and 30 ship deliveries are unchanged from our projections of last year. For those ships which have later projected deliveries, the reasons are varied.

The DDG-993 Class ships originally planned for Iran are being modified to satisy U.S. requirements in two phases. Phase I modifications which updated the ships to meet minimum Navy criteria were accomplished within the original contract delivery dates. Phase II modifications which added Survivability features, Fragmentation and Fire protection, and implemented DD-963 Class technical improvements, required an extension in delivery of approximately 5 months on three of the ships.

Eleven Guided Missile Frigates (FFG) have been delayed due to a strike at one yard.

During 1980, the five ship PHM production program experienced delays averaging an estimated 4 months for each ship caused primarily by shortages of contractor-furnished material and parts, material fabrication problems, re-machining of certain parts and assemblies, poor planning, excessive overtime and rework, and delays in outfitting. The contractor is adhering to the revised schedule and no further delays are expected.

One destroyer tender (AD 42) has been delayed approximately 2 months by slow labor progress and a wildcat strike last year.

The primary reason for the late fleet oilers (AO 178, 179, 180 and 186) is the heavy competition for skilled workers, which has caused manning problems, and the ripple effect that a boiler fire on the AO 177 has caused.

The cable repair ship (T-ARC) will deliver later due to the litigation regarding the award of the contract, total shipyard workload and a shortage of engineering manpower.

The two Fleet Ocean Tugs, T-ATF-171 and -172, will be delivered in the spring. A small delay in an earlier ship has caused the T-ATF-171 to "winter-over" because of the St. Lawrence Seaway winter closing. The T-ATF-172 will be delayed 1 month by the delay of the T-ATF-171.

Now I will discuss the status of the SSN 688 Attach Submarine and TRIDENT Strategic Ballistic Missile Submarine programs in greater detail.

TRIDENT AND SSN 688 CLASS SUBMARINE AUTHORIZATIONS

Program Year	70	71	72	73	74	75	76	77	78	79	80	81	82*
TRIDENT													
Submarines	-	-	-	-	1	2	1	1	2	0	1	1	1*
Total	-	-	-	-	1	3	4	5	7	7	8	9	10
SSN 688 CL													
Submarines	3	4	5	6	5	3	2	3	1	1	2	2	2*
Total	3	7	12	18	23	26	28	31	32	33	35	37	39

*Budget Request

CHART 4

As shown on Chart 4, nine (9) TRIDENT submarines have been authorized and funded with one additional submarine requested in the FY 82 budget. Contracts have been awarded to Electric Boat for the first eight ships. Delivery of the first TRIDENT is projected for December of this year.

Chart 4 also shows the total SSN 688 Class program. Thirty-seven (37) have been authorized and funded with two additional submarines requested in the FY 82 budget. Contracts have been awarded for the first thirty-three (33). To date, eleven (11) have been delivered; five (5) from Newport News and six (6) from Electric Boat. Ships of the 688 Class under construction are eight (8) at Newport News and fourteen (14) at Electric Boat. Five SSN 688 Class submarines are projected for delivery during the remainder of 1981; two from Newport News and three from Electric Boat.

I will next address the status of submarine shipbuilding at, first, Electric Boat, and then Newport News, followed by a summary of our overall shipbuilding program.

STATUS OF SHIPBUILDING AT ELECTRIC BOAT

There have been a number of problems at Electric Boat that have delayed the delivery of both TRIDENT ballistic missile submarines and SSN 688 Class attack submarines. Quality control problems including the acceptance and use of grades of steel not in accordance with requirements, incomplete and unsatisfactory structural welds and missing and improper weld inspection records have been the principal contributors to these delays. Repairs to equipment furnished by the Government and the added work or rework associated with design data revisions have contributed to the delays to a lesser extent. I intend to address each of these problem areas and to place each in proper perspective, including their relative impact on the delays in the delivery of these submarines.

Before proceeding, I need to mention two important facts. First, the breakdown in Electric Boat's Quality program did not extend to the submarines' pressure hull; Electric Boat has met the more rigorous quality requirements for pressure hulls. Secondly, all problems that could potentially compromise the safety of the submarines have been, or will be, corrected prior to the first sea trials.

SUMMARY OF NONCONFORMING STEEL PROBLEM

Both 688 and TRIDENT new construction submarine designs specify a certain grade of weldable mild carbon steel (equivalent to industry specification ASTM-A36) for many nonpressure hull applications including some where a lesser strength steel could be used. This approach simplifies the design process, minimizes the number of procurement actions, reduces storage and control requirements, reduces the number of required welding techniques and procedures, minimizes the potential for human error in installing the wrong steel during construction and, accordingly, should reduce total costs.

In November 1978, an Electric Boat employee discovered some steel bar stock whose color coding was not in agreement with the color code for the grade of steel it was specified to be. Improper grades of steel could pose a variety of problems in ship construction. For example, it may not be strong enough for its use in welded applications. Accordingly, Electric Boat in November 1978 commenced a warehouse audit to investigate this case of improper color coded steel.

In May 1979, Electric Boat notified the Navy of the results of this audit, reporting that five sizes of carbon steel bar stock had been found that did not have chemical properties in accordance with Electric Boat's purchase order requirements. A review of purchase and receipt inspection practices for this steel revealed that Electric Boat had accepted steel which did not meet specification and purchase order requirements. In some cases the steel was accepted even though reports furnished by the vendor with the steel indicated that it did not conform to requirements. Once these nonconforming grades of steel were placed in the warehouse inventories and commingled with other steel stock, it was no longer possible to easily distinguish them from conforming steel.

By July, additional investigations indicated that the problem was not limited to the five sizes initially identified by Electric Boat, but also included many other sizes of steel which could have been installed in as many as 61,500 locations in SSN 688 Class submarines or 126,000 locations in SSBN TRIDENT Class submarines.

Electric Boat's actions to determine the extent of commingling of conforming and nonconforming grades of steel included a review of purchase orders to establish the probable time frame of the problem and the quantity, sizes, and grades of steel involved. Extensive sampling of existing inventories was then performed to determine the grades of steel on hand which may have been substituted for the required steel. A total of 127 sizes and shapes of raw material stocks were eventually found to have been contaminated with 15 grades of nonconforming steel. Subsequently, all raw material stocks of this steel were impounded by Electric Boat and were not used unless correct material requirements were first verified.

Once the grades of steel were identified, their applications were considered. A list of specific applications on each ship and list of all ships on which the nonconforming grades of steel could have been installed were developed.

The approach used to resolve the problem was to determine which grades of steel in the warehouse inventories were the least weldable (the ability of the steel to be satisfactorily attached to other metal by a welding process) and the lowest strength. These were then used for subsequent testing and analysis. If tests of these "worst case" grades of steel proved satisfactory, the other grades of steel that had been idenfified could also be accepted. This testing indicated that the strength of some grades fell below that of the required steel. A design review of submarine applications was conducted to determine which applications did not require the full strength of the specified steel.

Considering the weldability of the nonconforming grades of steel, the investigation identified some steel where the carbon or sulphur content was excessive. High carbon content could result in the area adjacent to the weld becoming embrittled thus reducing its resistance to fracture failure, while the presence of sulphur in these grades of steel could promote cracking during the thermal cycles of welding.

All items then underwent an engineering evaluation for acceptability in their particular shipboard application. Electric Boat classified as "critical" any application where weldability was not satisfactory, where strength was not satisfactory, or where the item was used in a pressure containing system. A total of 452 items were classified by Electric Boat as "critical". Applications determined to be "critical" were checked to verify if a nonconforming grade of steel was installed. If installed, the item was either replaced or reinforced. The reinforcement option required waivers to the contract specifications since a nonconforming grade of steel would remain installed in the ship. Corrective action by Electric Boat and the submittal of waiver request continued until mid-1980.

For those applications of the nonconforming grades of steel that were not critical, Electric Boat submitted requests for waivers to the contract specifications together with supporting technical justification.

Electric Boat has since taken actions to strengthen their quality program in the area of receipt inspection and material control for structural steel to preclude further installation of nonconforming grades of steel.

Throughout this time period, the Navy monitored Electric Boat's actions and set up special procedures to expedite approval of Electric Boat requests for waivers to contract specifications, both at NAVSEA and at the SSN 688 Class design contractor, Newport News.

A precise estimate of delays in ship deliveries attributable to this problem is not available due to possible concurrent delay; however, in a letter to the Navy in November 1979, Electric Boat provided dates by which SSNs 697-699 could have been delivered taking into consideration only the correction of the nonconforming steel problem. These dates reflected delays in delivery of these three submarines of two, four and one month respectively.

SUMMARY OF STRUCTURAL WELDING PROBLEM

In early December 1979, a quality assurance auditor from the Supervisor of Shipbuilding's office discovered some incomplete structural welding on SSN 698 which Electric Boat had previously recorded as complete and satisfactorily inspected. By late December, the Supervisor had identified other deficient structural welding in the areas of frame to hull inserts, attachments to frames, and deck stanchions on SSN 698 and on SSNs 699 and 702 as well. With the discovery of these deficiencies, prudence dictated that the Navy consider that all structural welding was suspect. Electric Boat was requested to give urgent action to a program of additional inspections and reviews to assure satisfactory structural welding prior to sea trials of SSN 698.

Electric Boat initially reported that the welding problem was the fault of one, then later two, inspectors who had not adequately inspected the welding. In early January 1980, Electric Boat outlined its program to review the work these inspectors and stated, based on the status of the review, that preparations for SSN 698 sea trials should be postponed. In a mid-January letter to NAVSEA, Electric Boat advised that the weld review had disclosed a further problem that some of the structural welding record folders contained no records to establish that the required inspections had been performed, and that Electric Boat would now inspect the more significant accessible welds. The letter stated that the scope of the inquiry would include all ships under construction at Electric Boat.

Concurrent with Electric Boat's structural weld review program, the Supervisor's office was conducting independent audits of welding in various structural areas. Pressure hull areas were found to be satisfactory; however, numerous additional defects and missing records were identified in nonpressure hull areas and reported to Electric Boat.

In late January 1980, NAVSEA, as a result of the increasing number of reports of defective structural welding and missing welding records, requested Electric

Boat to provide information concerning the scope of their investigation. NAVSEA also advised Electric Boat that any work and inspections not in accordance with the specifications but which Electric Boat considered satisfactory, should be formally submitted to the Navy with supporting engineering justification to permit the Navy to evaluate granting of a waiver to the specifications.

In early February 1980, Electric Boat informed the Navy that the work of two additional inspectors might be inadequate and indicated that further reinspections were being conducted. Late in February 1980, Electric Boat indicated that after a detailed evaluation, the performance of the four inspectors was considered average and no longer suspect.

The Navy Supervisor of Shipbuilding at Groton, in a letter to Electric Boat, advised that this conclusion was not acceptable in that it treated each defective weld as an isolated case and did not consider related occurrences which could indicate a pattern of quality control deficiencies which would require expansion of the investigation.

The high percentage of welds for which the required inspection records were missing was revealed when Electric Boat at a briefing in early March, advised that they had sampled 137 structural drawings and checked for the corresponding inspection records. Records for 51 drawings (37%) were not retrievable. The Navy had to consider that if the records were not available, the proper inspections had not been accomplished.

The Navy again advised Electric Boat that if evidence of satisfactory welds could not be produced, Electric Boat should submit requests for waivers to contract specification backed by supporting technical justification. In mid-May, Electric Boat began a more comprehensive approach to the total welding problem by submitting an overall program to comply with specification requirements for structural steel welding for SSNs 698-702. The Navy approved Electric Boat's overall weld review program in August for the SSNs 698-702 and in September 1980 for SSBN 726. In December, Electric Boat notified the Navy that the program was being extended to SSNs 703 and 704, and SSBNs 727 and 728.

After completing their review. Electric Boat in their 26 September 1980 and 17 February 1981 letters, submitted a report of the results of the SSN 698 and SSBN 726 weld reinspection programs which gives some insight into the magnitude of the problem. Out of the 17,792 welds in the SSN 698 requiring Magnetic Particle (MT) inspection, 7,962 (45%) did not have inspection records; 6,893 of these were accessible and were reinspected; 2,802 welds required repair (27% of those reinspected). Out of 36,149 welds on the SSBN 726 requiring Magnetic Particle inspection, 9.693 (26.8%) did not have inspection records; 8,476 of these were accessible and were reinspected; 2,772 welds required repair (33% of those reinspected). In addition to these, Electric Boat also reinspected and repaired numerous welds that required visual inspection only.

In summary, a review of the defects identified during the weld reinspection program indicated a serious breakdown in workmanship and quality control in structural welding. Not only were plan requirements not allowed and jobs left incomplete, but deficiencies that affected all ships under construction were not detected by the quality control procedures at Electric Boat. The Navy expedited technical review of waiver requests and tasked the SSN 688 Class design contractor, Newport News, to review the technical rationale for the waivers to minimize schedule and cost impacts of these problems.

For those five SSN 688 Class submarines (SSNs 690, 692, 694, 696 and 697) already delivered by Electric Boat, the Navy imposed operating restrictions until the ships could be drydocked and inspected for welding defects that could compromise their safe operation at design depth. These inspections have now all been performed. For these same submarines, Electric Boat was requested in October 1980 to develop a plan of action for each individual ship for identifying, evaluating, and correcting where necessary, all not yet identified structural welding deficiencies. This plan has not yet been provided by Electric Boat.

As with the nonconforming steels, a precise estimate of the delay in ships' deliveries attributable to the welding problem is not available due to possible concurrent delays; however, the Navy's assessment is that the welding problem has caused delays in delivery of submarines SSNs 698-705 and SSBNs 726-728. The SSN 698, under construction at Electric Boat, was preparing for sea trials in December 1979 when this problem was first discovered and sea trials postponed. The ship was eventually delivered in February 1981, a delay of one year. Follow SSN 688 Class and TRIDENT submarines experience lesser delays dependent upon their status of construction when the problem was uncovered, with submarines nearest to completion experiencing the longest delays.

MISCELLANEOUS QUALITY ASSURANCE PROBLEMS

The following are brief descriptions of additional miscellaneous quality assurance problems that have occurred at Electric Boat over the past several years.

MATERIAL IDENTIFICATION AND CONTROL PROBLEM. In December 1976 while a seawater system was being readied for dockside operation on SSN 694, a threaded plug fell out of a piping system resulting in about 400 gallons of seawater entering the engine room. The threaded end of the plug had corroded away because it was made of steel instead of the required nickel-copper alloy. Subsequent investigation in other areas revealed scattered cases of incorrect material or incorrectly marked material, that had been used in seawater systems. Enough deficiencies were found to warrant continuance of the inspection program on this and all other submarines under construction at Electric Boat. On that basis rechecks were made of seawater plugs and all critical piping material on all SSN 688 Class submarines being built at Electric Boat. These postinstallation checks were made using simple nondestructive tests and are continuing today at Electric Boat.

DIRECT WORK ORDERS. In August 1980 missing deck structure was discovered in SSN 698 during the course of the structural weld review program. This work was originally scheduled to be done at Electric Boat's Quonset Point facility but was transferred for accomplishment to the Groton Facility. Investigation revealed that on both the SSN 698 and on the SSN 699 other minor structure that was to have been transferred was, in fact, not installed. The root cause of this problem was lack of accountability and follow-up to verify that work transferred to Groton was accomplished. Corrective and preventive action has been taken by Electric Boat on this issue.

IMPROPER PAINT. In September 1980, the Navy was informed that improper paint was being applied on SSN 688 Class submarines. Many areas were discovered where improper paint had been used. Corrective action included stripping and repainting some areas. Where technically justified, the Navy waived contract specification requirements and accepted the nonconforming paint.

DEFECTIVE PAINTING. In December 1980, Electric Boat submitted a waiver request to the Navy to defer final painting of the ballast tanks on the lead TRIDENT submarine (SSBM 726) until the first drydocking following delivery of the submarine to the Navy. The request for waiver to the specification advised that painting of these tanks prior to delivery would place an extraordinary burden on Electric Boat's paint department and would delay delivery of the ship. Concerned about preservation of these tanks, the Navy assembled a team of paint experts who inspected these ballast tanks and uncovered extensive paint system defects. The Navy estimated that approximately twenty-five percent of the total surface area of these tanks would have to be reworked to assure adequate preservation. Accordingly, the Navy disapproved Electric Boat's waiver request. Electric Boat has provided the Navy with a list of specific actions that are being initiated to correct quality program problems in the painting area.

QUALITY ASSURANCE

The problems of nonconforming grades of steel, incomplete welding, missing weld inspection records and other problems I have previously addressed indicate the Electric Boat's quality assurance program was not performing the functions required by the contract.

The contract requires the shipbuilder to establish a quality assurance program in accordance with the military specification (MIL-Q-9858A) entitled "Quality Program Requirements." The Navy adopted this specification in 1969 for all submarine new construction contracts. This specification was originally developed by the Department of Defense in 1959 in response to a recognized need for a structured approach to quality assurance for complex weapons systems and had subsequently been widely accepted throughout the defense industry. This specification requires that the contractor plan and execute a comprehensive quality assurance program. Specifically, programs must be developed to assure conformance to contract requirements through the control of all work operations and manufacturing processes, as well as through inspections and tests. All supplies and services furnished under the contract, whether manufactured or performed within the contractor's plant or at any other source, must also be controlled to assure compliance with contractual requirements (this includes control of purchased materials). Electric Boat Division of General Dynamics undertook those obligations in its contracts for the SSN 688 Class and SSBN TRIDENT Class submarines.

In April 1980 the Supervisor of Shipbuilding, in a letter to Electric Boat, expressed the Navy's concerns regarding Electric Boat's quality assurance programs; in particular, that proper emphasis was not being placed on certain areas of quality assurance and that deficiencies uncovered were being reviewed as isolated events without identifying the full scope of the problem and its underlying causes.

In May 1980, Electric Boat replied to the Supervisor's letter with a self assessment of Electric Boat's Quality Assurance program, documenting the actions being taken by the company to resolve the welding and nonconforming steel problems, and addressing new high technology systems in use at Electric Boat in support of their quality assurance program. Electric Boat's basic position was that the company's quality program is and always has been in compliance with MIL-Q-9858A since that specification was first invoked in 1969.

The Navy, still concerned at the extent and seriousness of the carbon steel and structural welding problems and the implication of more general quality assurance program deficiencies, conducted audits of both Electric Boat's and Newport News' quality programs. The audit at Electric Boat was conducted in June 1980. The NAVSEA audit report noted many weaknesses in Electric Boat's quality program but provided an overall evaluation that the basic procedural elements of a quality system existed. However, it was also NAVSEA's evaluation that there was not adequate implementation and execution of those elements and there was a notable lack of emphasis on trend analysis and corrective action before deficiencies were identified in the completed product. Electric Boat has placed emphasis on cost and scheduled performance and a policy of personal accountability for work assigned, which are important elements of a strong quality program; however, without effective audits, data analysis and positive corrective action feedback to discipline the system, the program cannot be truly effective and economical, nor can it be in full compliance with MIL-Q-9858A.

In August 1980, Electric Boat responded to the Navy's audit report. While accepting some of the Navy's recommendations, Electric Boat did not concur with many of the recommendations and again stated that Electric Boat had always considered its quality program to be in compliance with MIL-Q-9585A since that specification was first invoked. In September, NAVSEA reiterated those areas where the evidence indicated that Electric Boat's quality program required improvement.

In late October 1980 Electric Boat generally agreed to changes that the Navy considered necessary to bring their quality program into compliance with MIL-Q-9858A. Major quality program changes included: (1) an additional audit program for work completion; (2) use of departmental overview audits; (3) additional attention to effective audits, data analysis and corrective action feedback; (4) use of process, defect and variance analysis; (5) additional resources to increase the frequency of surveys of the quality program of rated vendors and (6) restructuring and expansion of quality audit activities. A revised "Quality Program Management Plan" incorporating these changes was also developed and provided to the Navy. NAVSEA reviewed Electric Boat's revised program and in November 1980 notified Electric Boat that their plan was acceptable.

The latest TRIDENT submarine contract with Electric Boat incorporates this revised Quality Program Plan and also requires periodic audits by the Government of the contractor's Quality Program for compliance with MIL-Q-9858A and quarterly Quality Program management meetings between the contractor and the Government.

If the actions that were eventually agreed to by Electric Boat had been taken immediately upon the first indication of problems with the nonconforming grades of steel and incomplete welding, I believe that the full scope of these problems and, therefore, their eventual correction, would have occurred in a more timely fashion. The overall delay of the ships could have been shortened if the proper emphasis to problem identification had been exercised by the contractor.

REPAIRS TO GOVERNMENT FURNISHED EQUIPMENT

During the construction of SSN 688 Class and TRIDENT submarines, a problem with the main propulsion turbines on both classes of ships was discovered. The turbines are procured by the Navy from General Electric company and furnished to the shipbuilder for installation in the ships. The initial indications of this problem were uncovered during an inspection, in September 1979, of one of the turbines on an SSN 688 Class submarine under construction at Electric Boat. Subsequent investigations by General Electric confirmed the problem. Specifically, cracks had developed in the rotating portions of the turbines. Investigations revealed that vibrations at high operating speeds caused fatigue cracks. New rotors incorporating required design changes were provided to Electric Boat for the TRIDENT submarine in December 1979 and were installed by Electric Boat in January 1980. For the SSN 688 Class submarines under construction at Electric Boat, those repairs necessary to permit safe operation were authorized. Other fixes were deferred to the first Post Shakedown Availability (PSA) following delivery. During this same period, the ship service turbine generators procured by the Navy from Westinghouse and furnished to the shipbuilder on the lead TRIDENT submarine were discovered to be out of balance, resulting in structureborne noise levels in excess of allowable limits. This necessitated rebalancing of the turbine generator rotors.

For the TRIDENT submarine OHIO, a ship delivery delay of approximately 60 days for the work required by the shipbuilder to correct these deficiencies was agreed to between the Navy and Electric Boat and a bilateral contract modification was executed. For SSNs 697-699 the contractor was directed to make only those interim modifications necessary for the ships to proceed to Post Shakedown Availability (PSA). During the respective PSAs for these ships, the Navy will complete all required modifications. The repairs made by the contractor were accomplished concurrent with correction of the nonconforming steel. The rotor repairs on each submarine were completed in approximately three to five weeks.

DRAWING REVISIONS

In general, design data and drawings necessary for the construction of naval ships are developed by a shipbuilder or a naval architectural firm under contract with the Navy. For TRIDENT submarines, Electric Boat, under separate contracts, is both design contractor and shipbuilder. Under this arrangement, Electric Boat, the design contractor, provides Electric Boat, the shipbuilder, with detail drawings and other data necessary for construction of the TRIDENT submarines. Approximately 10,600 construction drawings are required and have been issued. During the design and construction process of any complex warship, the drawings are often revised to reflect such items as design and construction errors, Government authorized changes, inconsistencies between drawings, and administrative or editorial changes.

The process employed at Electric Boat to communicate information rapidly concerning design data revisions is the use of an Engineering Notice (EN), a multi-purpose design and construction document. The ENs are issued to all involved departments at Electric Boat, the follow yards (if any), and to the Navy. The information contained in these ENs is later incorporated into formal drawing revisions. To date, for TRIDENT, approximately 25,000 revisions have been identified, for an average of less than 2.4 revisions per drawing. This average compares favorably to other classes of submarines and other ship types as indicated on Chart 5.

DRAWING REVISIONS PER DRAWING FOR VARIOUS CLASSES OF SHIPS

Class	Drawing Revisions/Drawing
SSN 637	5
FFG 7, LHA & DD 963	4 to 7
Three Classes of Tankers Designed by a Private Builder for Commercial Customers	2.9 to 4.2
SSBN 616 Class (Follow-Shipbuilder)	6
SSN 688	5.2
SSBN 726	2.4*

*Based on 25,000 drawing revisions identified as of February 1981.

CHART 5

Not all revisions require work by the shipbuilder. Drawing revisions are used for many purposes other than new work, such as, documentation of installations that do not conform to the original drawing requirements but which are considered satisfactory, reduction in the inspection or testing requirements specified on the drawings, changing of part numbers, and general administrative or editorial revisions. During calendar year 1980, about 40% of the ENs issued required no work by the shipbuilder. Of the ENs issued during this time period, the shipbuilder has requested an equitable adjustment to the contract price and delivery schedule in about 25% of the cases.

The negotiation and execution of bilateral contract modifications which reflect appropriate equitable adjustments has been a problem. For over a year, Electric Boat has included in its proposals costs associated with performance of the work ("hardcore" costs), but in many cases has reserved its rights to claim, in the future, delay, and the costs associated with the delay. The Navy has requested Electric Boat to submit fully priced proposals so that the contracts will contain a contract price and delivery schedule which reflect events to that date. For the most part, submission of fully priced proposals has not occured. Accordingly, the Navy has taken appropriate contractual actions, since bilateral agreements could not be reached, to assure timely accomplishment of mandatory work and to minimize delay in delivery of OHIO. In addition, Navy representatives meet daily with the design contractor and the shipbuilder to review all ENs. The purpose of these reviews is to ensure that only those ENs covering mandatory work are issued and to effect prompt authorization for mandatory work.

DELIVERY SCHEDULES

ELECTRIC BOAT DIVISION
TRIDENT DELIVERY SCHEDULES

SHIP	ORIG. CONTR. DEL. DATE	EB EST. FEB. 78	EB EST. MAR 81	NAVY ESTIMATE
726	4/30/79	11/80	10/81	12/81
727	4/30/80	11/81	10/82	12/82
728	12/30/80	7/82	8/83	9/83
729	8/31/81	3/83	4/84	5/84
730	4/30/82	11/83	12/84	1/85
731	12/31/82	7/84	8/85	9/85
732	8/31/83	3/85	4/86	5/86
733	5/31/86	—	12/86	1/87

CHART 6

Chart 6 shows the TRIDENT submarine delivery schedules. On 28 August 1980, Electric Boat provided a revised delivery date of June 1981 for the lead ship, OHIO, SSBN 726. Dates for the follow ships were not changed from those provided by Electric Boat in February 1978. In a letter dated 3 October 1980, Electric Boat advised the Navy that because of events subsequent to August 1980, it could no longer deliver the ships in accordance with the previously provided schedules.

On 25 March 1981, Electric Boat advised the Supervisor of Shipbuilding, Conversion and Repair, Groton, that they plan to deliver the OHIO, SSBN 726, on 31 October 1981; the MICHIGAN, SSBN 727, a year later, and the FLORIDA, SSBN 728, 10 months thereafter. They stated that subsequent ships would be delivered at 8-month intervals. The last column on this chart shows my assessment of the delivery dates for the TRIDENT submarines and takes into consideration the present state of construction of each ship, correction of quality assurance problems, and construction time frames based on recent experience at Electric Boat. This assessment is based on the following assumptions: (1) applications of manpower by Electric Boat consistent with the strategic priority of the TRIDENT program and (2) a reasonable increase in shipyard work force.

ELECTRIC BOAT DIVISION

SSN 688 CLASS DELIVERY SCHEDULES

SHIP	P.L. 85-804 EB FEB 78 DEL. DATES	EB AUG 80 DEL. DATES	EB DEC. 80 DEL. DATES	NAVY DEC 80 DEL. DATES
698	10/79	12/80	2/81	2/81
699	2/80	2/81	4/81	4/81
700	6/80	4/81	5/81	6/81
701	10/80	6/81	9/81	10/81
702	2/81	7/81	10/81	2/82
703	6/81	9/81	11/81	6/82
704	2/82	2/82	-	12/82
705	6/82	6/82	-	4/83
706	10/82	10/82	-	10/83
707	1/83	1/83	-	2/84
708	9/83	9/83	-	6/84
709	1/84	1/84	-	10/84
710	5/84	5/84	-	2/85
719	-	8/84	-	6/85
720	-	3/85	-	10/85

CHART 7

Chart 7 shows the SSN 688 Class submarine delivery schedules. Electric Boat has rescheduled the delivery of SSNs 698-703 twice since the P.L. 85-804 settlement in June 1978. These delays range from 16 months later than deliveries established in the settlement for SSN 698 to 5 months for SSN 703. Electric Boat maintains that the balance of the ships (SSNs 704-710 and SSNs 719-720) will deliver as scheduled. Based on the assumptions regarding the availability and the application of resources stated above, my assessment of the schedules are shown in the last column. I am projecting delays in all SSN 688 Class delivery dates.

Relative to the present efforts at Electric Boat, the progress that has been made in the past year includes the delivery of the attack submarine BREMERTON (SSN 698) and initial reactor critically and dockside propulsion plant testing on the lead TRIDENT submarine, OHIO (SSBN 726). Another attack submarine, JACKSONVILLE (SSN 699), has completed initial sea trials and is nearing delivery. The test program on SSBN 726 is nearing completion and the ship is expected to go on initial sea trials this summer.

INSURANCE

Since 1942, the Navy has acted as a self-insurer of builder's risk associated with the construction of new ships. The scope of the insurance coverage is stated in the insurance clauses of the contracts as the risks of loss or damage which a commercial underwriter would assume under the "Marine Builder's Risk (Navy Form-Syndicate)" policy. The type of loss or damage, which the Navy policy covers, must be caused by an event which is fortuitous, unexpected and accidental. The loss or damage must result from events which cannot be foreseen and that occur as a matter of chance, such as fire, explosion or accidental breakage. Examples of insurable events include damage to equipment caused by fires, or damage to an item dropped due to failure of a lifting sling. These are insurable events under the Navy policy. The Navy has maintained, however, that the insurance clause and the Builder's Risk policy do not cover delay and disruption costs incident to an insurance covered event or the costs to correct faulty workmanship or defective material. In other words, the insurance clause and Builder's Risk policy do not provide a mechanism for payment for contractor rework of the type normal in the performance of the contract.

In November 1979, the Navy was notified in writing by Electric Boat that the costs associated with correction of the nonconforming steel problem were considered within the insurance risks assumed by the Government under the insurance provisions of the applicable contracts. The Navy informed Electric Boat that it sees no basis for a claim under the insurance or any other provisions of the contract for the nonconforming steel problem. Similarly, in October 1980, the company informed the Navy of its position that the cost and delay associated with the correction of defective welding are risks assumed by the Navy under the insurance provisions. The Navy responded that any cost and delay consequences associated with the welding reinspection and repair programs are not assumed risks under the Builder's Risk insurance provisions. In February, in order to avoid a backlog of potential claims, the Navy requested Electric Boat to submit its schedule for claims submissions or to withdraw its assertions of Navy liability. On 17 February 1981, Electric Boat advised the Navy that its reimbursement requests for the welding reinspection program for the SSN 698 would be submitted at the end of February or early March 1981, and that reimbursement requests for correction of the nonconforming paint problem would be submitted in June or July 1981. Due to ongoing company efforts to recover from its suppliers, no date was provided for submission of a reimbursement request for the nonconforming steel. The Navy Office of General Counsel has Electric Boat's assertions under study. I feel that the Navy's position in this matter will prove to be the correct one.

COST OF DELAY

Although not all the information is in and although not all of Electric Boat's records are available, the quality assurance problems at Electric Boat significantly delayed both the SSN 688 and TRIDENT programs. During this period of time, repairs to Government furnished equipment and changes originating with the design contractor contributed to a lesser extent to the total delay. To take the SSN 698 as an example, the cumulative delay to the ship was approximately sixteen months from the delivery date established in the P.L. 85-804 settlement

Later ships have been delayed somewhat less. While the ultimate costs associated with the quality assurance problems are not readily quantifiable, a Defense Contract Audit Agency (DCAA) review of costs recorded by Electric Boat through December 20, 1980 indicate charges, not including delay or disruption costs, of approximately $2.8 million for the contractor's evaluation of the nonconforming steel problem, $67 million for the defective weld problem, and $1 million for the epoxy paint problem.

The Navy at this time has not established who is responsible for what portion of the delay and cost to the program. Until the complex contractrual and factual issues have been resolved, we will not be in a position to give a precise allocation of liability. However, in my opinion, responsibility and liability for quality control problems such as steel, welding and paint are with the contractor. It is Electric Boat's obiligation to deliver a quality product which conforms to the specifications of the contract.

STATUS OF SHIPBUILDING AT NEWPORT NEWS SHIPBUILDING

Newport News currently has eight (8) SSN 688 Class submarines in various stages of construction. Seven (7) of these are experiencing delays that will impact delivery schedules.

NEWPORT NEWS SHIPBUILDING

SSN 688 CLASS DELIVERY SCHEDULES

SHIP	ORIG. CONTR. DEL.	CURRENT EST. DEL.
711	7/80	4/81
712	6/81	11/81
713	2/82	8/82
714	9/82	1/83
715	3/83	6/83
716	9/83	11/83
717	3/84	4/84
718	9/84	9/84

CHART 8

As shown on this chart, the delays, relative to the original contract delivery dates, vary from nine (9) months for the SSN 711 to one (1) month for the SSN 717 with the SSN 718 still estimated to deliver by the original contract delivery date. The SSNs 711-713 were delayed by five (5), three (3) and one (1) month, respectively, as a result of Newport News Shipbuilding's late erection of hull units, late placement of purchase orders and late delivery of piping assemblies. The SSNs 711-717 were delayed various amounts ranging from a high of two (2) months to a low of ten (10) days because of the United Steelworkers of America (USWA) strike that occurred January through April 1979. A mandatory modification to Government furnished turbine rotors caused two (2) to three (3) months of delay on SSN 711. The exact amount of this delay is still under negotiation.

QUALITY ASSURANCE. No quality assurance problems of any significant have been uncovered at Newport News.

NONCONFORMING GRADES OF STEEL. Following the problem at Electric Boat with the use of nonconforming grades of steel, the Navy assembled an audit team that investigated procurement and receipt inspection practices at Newport News and all naval shipyards engaged in submarine work to determine if similar problems existed at these yards. Only comparatively minor deficiencies were uncovered at the facilities inspected. No deficiencies were uncovered which resulted in delivery delays for submarines in overhaul or under construction at these facilities.

WELDING PROBLEM. As with the nonconforming steel problem, the Navy assembled an audit team to conduct an investigation of submarines under construction at Newport News following discovery of the welding deficiencies and missing weld records at Electric Boat. This audit team reviewed the structural welding and weld inspection records for the SAN FRANCISCO (SSN 711) and the ATLANTA (SSN 712). This special audit did not uncover any significant deficiencies in the Newport News program. Newport News has corrected those deficiencies that were discovered and strenghtened their procedures to preclude future recurrences. No delays in ship deliveries were attributable to correction of the deficiencies that were found.

QUALITY ASSURANCE AUDIT. As I stated in my detailed discussion of quality assurance problems at Electric Boat, the Navy elected to conduct audits of the Electric Boat and Newport New quality programs. The Navy team conducted the audit of Newport News Shipbuilding on 7 July 1980. The audit report noted some inadequacies in the overall program for which Newport News initiated immediate corrective action.

COST PERFORMANCE

The cost performance of each shipbuilder is affected by the scheduled and quality performances discussed above.

Actual return costs provide a significant indicator and are now available for the first five SSN 688 Class submarines delivered by each of the shipbuilders. The average shipbuilding cost for each submarine was $98 million at Newport News at Electric Boat.

Quality control and schedule problems have affected the costs to complete submarines at Electric Boat. At the time of the P.L. 85-804 settlement in June 1978, Electric Boat Division estmated that 120.9 million manhours would be required to construct the eighteen SSN 688 Class ships covered under agreement. Electric Boat Division's most recent manhour estimate has risen to 127 million manhours, an increase of 5% since 1978. The eight SSN 688 Class submarines now under construction at Newport News Shipbuilding are actually underrunning the estimate of manhours on which the target price of the contract was based by 3.4%.

In the case of the TRIDENT submarines, Electric Boat's estimates for the lead TRIDENT have grown from 14.6 to 23 million manhours since contract award. The shipbuilder estimates for the remaining TRIDENTs also have shown an increasing trend during the past year, but at a lesser rate. Even with these increases, Electric Boat projections of final cost do not reach the point where the contractor must assume 100% of additional costs.

SUMMARY

In summary, serious quality control and assurance probelsm have been experienced at Electric Boat. Similar problems were not experienced at Newport News.

Electric Boat has proposed specific actions to upgrade their quality assurance programs. A period of time will be required before all of these changes are fully instituted. The Navy's monitoring of Electric Boat's quality assurance programs has been increased and steps have been taken to add quality assurance specialists to the Supervisor's staff.

The quality assurance problems have caused substantial delays in the delivery of submarines by Electric Boat and have been the primary cause of the delays experienced during the past eighteen months. Corrective action is still underway (welding problem) on those submarines not yet delivered; however, I have factored this into my delivery estimates on the preceding charts.

The Navy is actively working to assist Electric Boat in the resolution of outstanding problems. Additionally, daily meetings have been established with Electric Boat management and the Supervisor of Shipbuilding's office to provide a forum for the exchange of information and resolving of administrative log jams. I have also appointed a special representative, RADM Eustace, who was previously Supervisor of Shipbuilding at Newport News, Virginia, and has extensive experience in the construction of ships including nuclear submarines and brings extra management expertise to bear on the problems at Electric Boat.

The delivery of submarines under construction at Electric Boat will depend to a large degree on the actions of Electric Boat management; on how they train and apply available management and labor resources; on the emphasis they place on such aspects of shipbuilding as quality assurance and the rapid identification and resolution of problems; and finally on their dedication to the timely delivery of quality submarines.

The Congress must understand that the submarines delivered by Electric Boat since the quality assurance problems are good quality ships. I have high confidence that the future submarines will also be good ships and that the crews will have confidence that they can safely operate the ships and fight if necessary.

The Navy has made an extraordinary effort to provide for the earliest delivery of submarines by Electric Boat consistent with standards of quality necessary for nuclear submarines. I have provided our best judgment of delivery schedule and cost estimates. The large amount of work at Electric Boat makes the potential for future delays and cost increases more likely than the expectation that these estimates will be improved.

ESCALATION AND COST GROWTH

The FY 1982 Shipbuilding and Conversion Navy budget includes a funding request for the completion of ongoing programs authorized by the Congress in previous years.

The Navy has requested funding in the past related to the completion of prior year programs in two procurement line items entitled "Escalation" and "Cost Growth." By way of introduction, I would like to spend just a few moments discussing the content of these two line items.

All shipbuilding programs involve numerous contracts. In most instances, the single largest contract is the "basic ship construction contract" between the Navy and the shipbuilder. This contract provides for the construction of the hull and the installation of material which make the ship ready for sea. Other contracts with various suppliers provide much of the equipment which will be installed aboard the ship by the shipbuilder. There may be hundreds of contracts required for a complex combatant, and only a few contracts for an auxiliary ship. Basic ship construction contracts typically provide for reimbursement to the shipbuilder for inflation as measured by the Bureau of Labor Statistics (BLS) in the "Steel Vessel Construction Index." This BLS index is the shipbuilders' equivalent of the Consumer Price Index.

DEFINITIONS

ESCALATION

SHORTFALLS IN THE AMOUNTS OWED TO
SHIPBUILDERS FOR INFLATION ON
THE BASIC SHIP CONSTRUCTION CONTRACT.

COST GROWTH

SHORTFALLS IN:

- O THE UNINFLATED COST OF A BASIC SHIP CONSTRUCTION CONTRACT

- O ANY OTHER CONTRACT

CHART 9

Given this background, I can define "Escalation" as including the funds required for shortfalls in the amounts owed to shipbuilders for inflation on the basic ship construction contract. "Cost Growth" is defined as including the funds needed for shortfalls which may occur in the uninflated cost of the ship construction plus shortfalls on any of the other contracts. Therefore, requests for "Escalation" by and large result from the performance of the economy

FY 1982 REQUEST

ESCALATION	$224.0 MILLION

PRIMARILY DUE TO

O HIGHER THAN PROJECTED INFLATION WHICH OCCURED DURING FY 1979

O INITIAL CONGRESSIONAL REQUEST WAS REDUCED IN THE BUDGET AMENDMENT TO REFLECT LOWER PROJECTIONS OF FUTURE INFLATION.

CHART 10

The amended FY 1982 request contains $224.0 million for "Escalation" which is required to complete prior year shipbuilding programs. The original FY 1982 budget request was submitted in the amount of $360.5 million. The request was based on adjustments to reflect actual 1980 inflation and higher estimates of future inflation than had been anticipated at the time of prior year budget submissions. Recently, the Office of Management and Budget provided revised projections of inflation rates for future years. These revised rates permitted the request to be reduced to $224.0 million.

FY 1982 REQUEST

COST GROWTH	$88 MILLION
O SSN 688 ATTACK SUBMARINE PROGRAM	
OO COST SHARING PROVISIONS ON JUNE 1978 P.L. 85-804 SETTLEMENT ON FY 1972-1974 SHIPS	$26 MILLION
OO VERTICAL LAUNCH TOMAHAWK BACKFITTED INTO FY 1980 SHIPS	$40 MILLION
O CVN 71 NUCLEAR AIRCRAFT CARRIER	
OO UPGRADE NAVY TACTICAL DATA SYSTEM	$22 MILLION

CHART 11

In addition, $88.0 million is required for "Cost Growth" to fund the completion of prior year programs. This funding is required for three specific items related to the SSN 688 Class submarine program and the CVN aircraft carrier program.

The first item results from the June 1978 P.L. 85-804 claims settlement with the Electric Boat Division of General Dynamics for the SSN 688s in the FY 1972 through FY 1974 programs. The reformed contract for these ships provided for the government and the shipbuilder to share equally the first $100 million of cost increases above the price negotiated at that time. The Navy now estimates that costs will exceed the negotiated price by at least $100 million. This will result in an additional $50 million of government liability. A total of $24 million will be reprogrammed from other sources to reduce the additional funding requested in this budget submission to $26 million.

The second part of the Cost Growth request pertains to an improvement in the capability of SSN 688 Class submarines. The end cost of the FY 1982 SSN 688 ship includes the cost to introduce a Vertical Launch TOMAHAWK missile system and the attendant production start-up costs required to accomodate this system aboard all future SSN 688 Class submarines.

The construction schedule for some prior year SSNs also affords the opportunity to backfit this capability into the FY 1980 ships, the SSN 721 and SSN 722. This will require some changes to the design of the ship and hull structure in order to accommodate the missile launch tubes and associated fire control systems. The $40 million requested for this item will fund all work performed on the SSN 721 and SSN 722 up to the planned deliveries of these FY 1980 ships. Additional OPN and O&MN funding to complete the work package will be requested after the delivery of the ships.

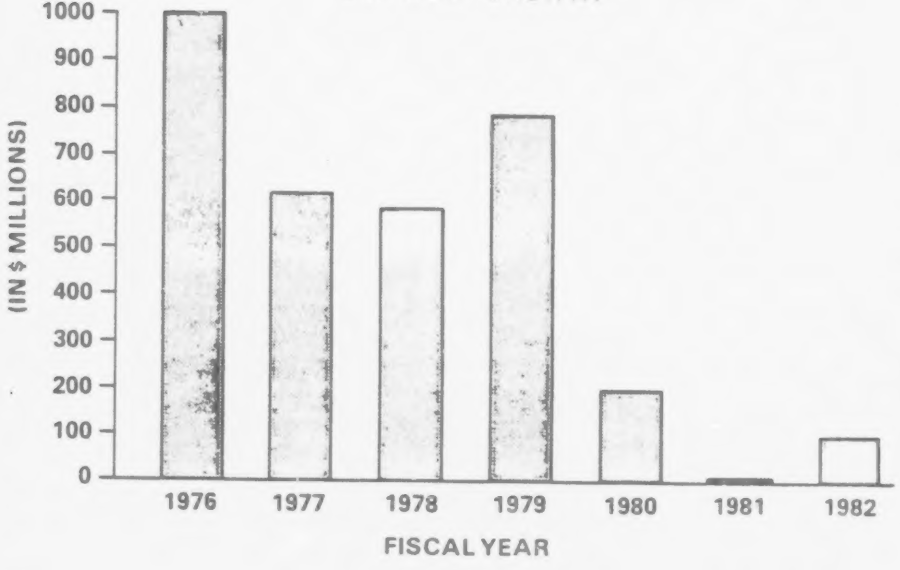
The third effort to be accomplished with this funding is an improvement to the computer data systems aboard the CVN 71 nuclear aircraft carrier. Funds are currently budgeted within the end cost of the CVN 71 for a Naval Tactical Data System (NTDS) suite. This cost growth request of $22.0 million will provide additional funds to design, procure and install an upgraded system on the CVN 71. This same NTDS system upgrade will also be incorporated into all future funding requests for aircraft carriers in the new construction program and the Service Life Extension Program.

chart # 12 To put cost growth into perspective, this request of $88.0 for FY 1982 cost growth to complete current programs is less than 3/10 of 1 percent of the value of the ongoing program.

FY 1982 REQUEST

COST GROWTH $88.0 MILLION

SCN COST GROWTH



In summary, the status of the current shipbuilding program is good except for submarines. There have been some delays for the reasons I have discussed. At the same time, except for the effects of inflation, ships are generally being constructed within budgeted cost estimates. The Navy today has no outstanding claims on any current shipbuilding contract.

Navy ships are complex. They take a long time to build, and they require substantial investments in plant and equipment. For a program which involves 94 ships under construction contract, with appropriated end costs of approximately $27 billion, there will be some problems. However, all things considered, I feel justified in my conclusion that they Navy shipbuilding program is under control.

FY 1982 FIVE YEAR SHIPBUILDING
PROGRAM AS AMENDED

	FY 82	FY 83*	FY 84*	FY 85*	FY 85*
TRIDENT FLEET BALLISTIC MISSILE SUBMARINE (TRIDENT)	1	1	1	2	1
NUCLEAR ATTACK SUBMARINE (SSN 688 CLASS)	2	1	1	1	2
NUCLEAR ATTACK SUBMARINE (FA CLASS)	–	–	–	1	–
NUCLEAR AIRCRAFT CARRIER (CVN)	–	1	–	–	–
AIRCRAFT CARRIER (CV-SLEP)	–	1	–	1	–
AIRCRAFT CARRIER (CV-34 REACTIVATION)	1	–	–	–	–
GUIDED MISSILE CRUISER (AEGIS) (CG)	3	2	4	4	4
BATTLESHIP (BB REACTIVATION)	1	1	–	–	–
GUIDED MISSILE DESTROYER (DDG-X)	–	–	–	–	1
GUIDED MISSILE FRIGATE (FFG-7)	3	2	–	–	–
NRF CORVETTE (FFX)	–	–	1	2	3
DOCK LANDING SHIP (LSD)	–	1	–	–	–
MINE COUNTERMEASURES SHIP (MCM)	1	–	4	4	4
SALVAGE SHIP (ARS)	2	1	1	–	–
FLEET OILER (TAO)	1	–	2	2	2
HOSPITAL SHIP (TAH) (C)	–	1	–	–	–
CABLE LAYING AND REPAIR SHIP (TARC)	–	–	–	–	1
COMBAT STORE SHIP (TAFS) (C)	2	–	–	–	–
OCEAN SURVEILLANCE SHIP (TAGOS)	4	3	3	–	–
SURVEYING SHIP (TAGS) (C)	–	–	2	–	–
AUXILIARY LIGHTER SHIP (TALS) (C)	1	–	–	–	–
FBM RESUPPLY SHIP (TAK) (C)	–	–	1	–	–
MARITIME PREPOSITIONING SHIP (TARX)	1	1	2	2	2
MARITIME PREPOSITIONING SHIP (TAKX) (C)	2	2	–	1	–
FAST LOGISTICS SHIP (TAKRX) (C)	8	–	–	–	–
TOTAL NEW CONSTRUCTION	18	13	16	18	20
CONVERSIONS (C)	15	5	6	2	–
TOTAL	33	18	22	20	20

*FY 83 thru FY 86 subject to change

CHART 13

Having given you a report on the status of the current program, I will now turn to an assessment of our capability to carry out the program which is being requested in the FY 1982 Budget Submission. The budget has been amended to include 18 new construction and 15 conversions in fiscal year 1982. The program shown for FY 83-86 is the original January submission with some changes.

FIVE YEAR MARAD FORECAST

SHIPTYPES	JANUARY 81 PROJECTION
CONTAINERSHIPS	13
ROLL-ON/ROLL-OFF (RO-RO)	5
LASH	3
TANKERS	32
LIQUID NATURAL GAS TANKERS	9
GREAT LAKE BULKERS	5
DRY BULK	27
	94

CHART 14

The shipbuilding and ship repair industry must also support the commercial maritime fleet and the U.S. Coast Guard. The Maritime Administration (MARAD) commercial ship construction projection for the next five years is shown here. The MARAD projection is based on a survey of the shipping industry owners and operators who must speculate on both transportation market and maritime legislative action. The MARAD projection, therefore, does not constitute a "program." Actual construction undertaken in the past has varied considerably from the projection. In addition, the Coast Guard is planning to build 16 ships over the next five years.

chart # 15 This chart portrays the total shipbuilding industry workload forecast in terms of employment for the private sector through 1987. Included are workload curves for commercial overhaul and repair, Navy overhaul and repair as well as Navy and commercial new construction under contract. In addition, we provide projections of the Navy new construction workload in the FY 82-86 profile I showed earlier and the five year forecast for commercial new construction by MARAD and the Coast Guard.

As a consequence of the shipbuilding programs over the last few years, there will be a decrease in workload in 1981 and 1982 since the workload effects of the FY 81 and 82 ships do not impact the shipyards until late 1982 and beyond. This is a loss of manpower that we will have to regain to support the 82 program as it begins to require manpower increases in 1983. This new program does not exceed the most recent industry peak which occurred in late 1977.

RESOURCES AVAILABLE IN PUBLIC AND PRIVATE YARDS

chart # 16 There are currently 25 private shipyards in the United States which are building or have built and maintained ships for the Navy and the merchant fleet. Of these 25 yards, there are 12 major shipyards so categorized because of their overall capability from the standpoint of workforce size and facilities. Due to the relatively low level of Navy and commercial shipbuilding over the past several years, some of these major yards have been reduced to minimal workload. These yards are relying on construction of barges, oil rigs or other work in order to sustain their operations. In January of this year, Sun Shipbuilding

SHIPBUILDING INDUSTRY WORKLOAD FORECAST
PRIVATE SHIPYARDS TOTAL EMPLOYMENT
MARCH 16, 1981

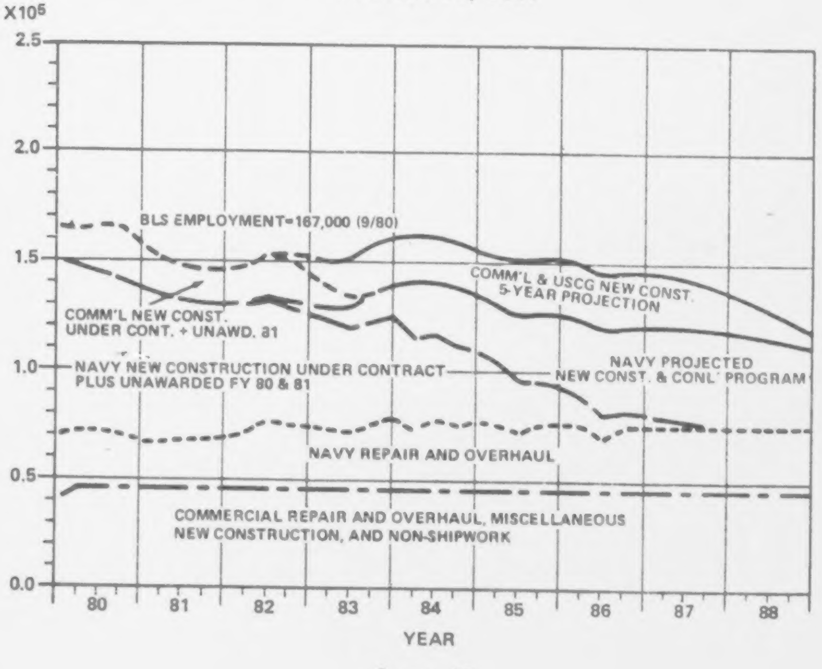
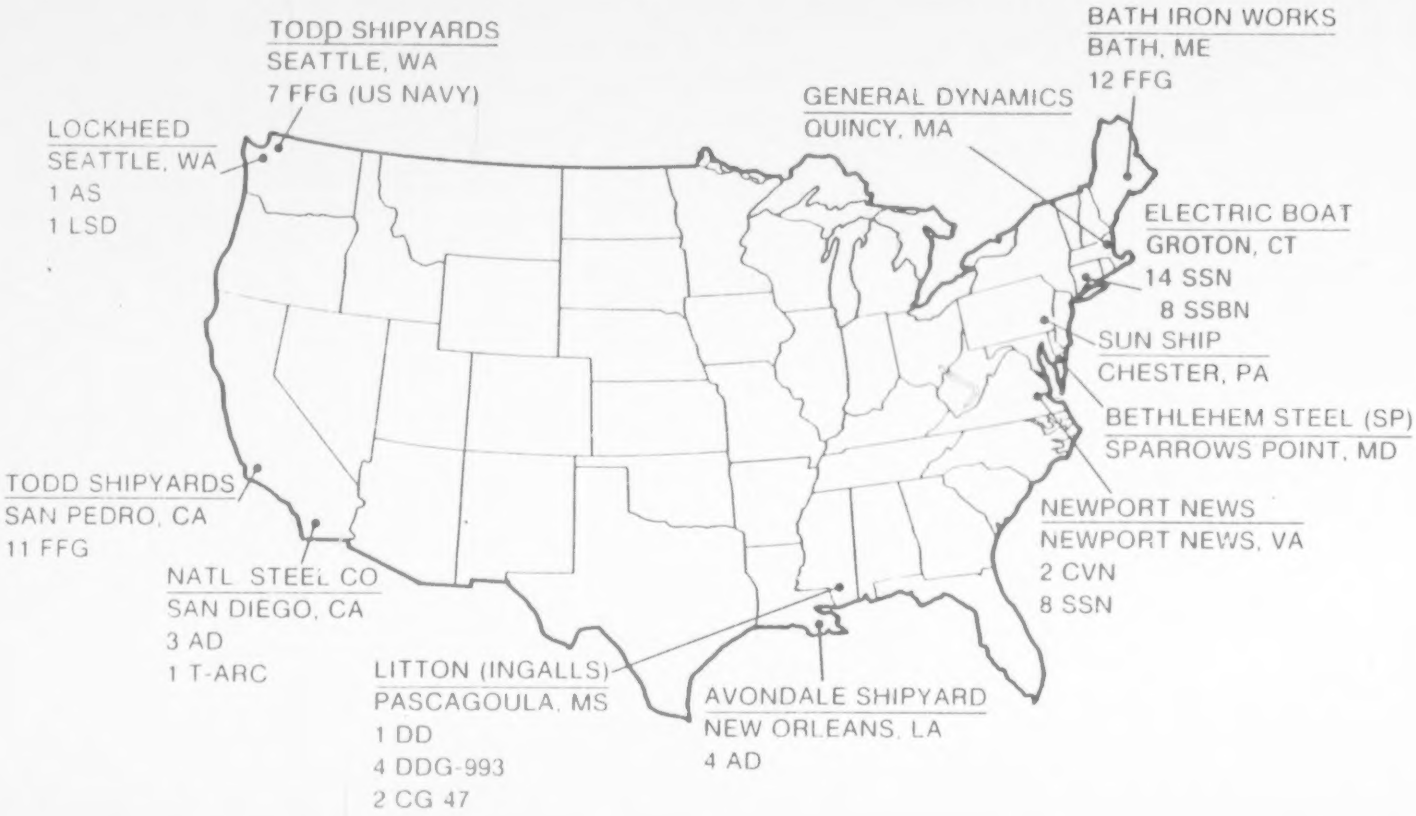


CHART 15

CHART 16

MAJOR PRIVATE SHIPYARDS AND CURRENT CONSTRUCTION ASSIGNMENTS


TODD SHIPYARDS
SEATTLE, WA
7 FFG (US NAVY)
LOCKHEED
SEATTLE, WA
1 AS
1 LSD
TODD SHIPYARDS
SAN PEDRO, CA
11 FFG
NATL STEEL CO
SAN DIEGO, CA
3 AD
1 T-ARC
LITTON (INGALLS)
PASCAGOULA, MS
1 DD
4 DDG-993
2 CG 47
AVONDALE SHIPYARD
NEW ORLEANS, LA
4 AD
GENERAL DYNAMICS
QUINCY, MA
BATH IRON WORKS
BATH, ME
12 FFG
ELECTRIC BOAT
GROTON, CT
14 SSN
8 SSBN
SUN SHIP
CHESTER, PA
BETHLEHEM STEEL (SP)
SPARROWS POINT, MD
NEWPORT NEWS
NEWPORT NEWS, VA
2 CVN
8 SSN

announced that it will no longer seek new construction business. Of the nine major private shipyards currently engaged in Navy construction, three are constructing auxilliary and amphibious ships, five are constructing major combatants and one, Electric Boat, constructs only Submarines.

Newport News Shipbuilding is capable of building virtually any ship required by the Navy. In past years, they have built nuclear cruisers, nuclear submarines and nuclear carriers. They are currently the only private yard in the United States that is nuclear qualified for surface ship work. Newport News and Electric Boat currently make up our only sources for construction of nuclear submarines. Until 1967, we had seven active nuclear qualified yards engaged in submarine construction. That number dwindled to five in 1970 and to these two yards in 1972.

SHIPYARD CAPACITY

NUMBER OF SHIPYARDS AND SHIPBUILDING WAYS

SIZE OF DRYDOCKS AND PIERS

AVAILABILITY OF LABOR FORCE

YARD LAYOUT

CHART 17

Four factors define shipbuilding capacity:

-The number of shipyards and the number and size of shipbuilding ways, building docks and land level facilities. This determines the number of ships that can be built, converted or overhauled at one time.

-The length, breadth and depth of drydocks and the pierspace available. These factors control the size ship that can be built, converted or overhauled.

-The availability of a shipyard labor force in a given area which places a limit on the number of ships that can be worked on at one time.

-The layout of the yard as it limits the ability of a shipyard to do certain kinds of work to adapt to new techniques in construction.

The size and availability of shipways, for new construction, and drydocks and piers for conversions is critical because this program includes a number of large ships. The number of facilities large enough to build or convert these ships is limited. We must ensure that the necessary facilities are available when and where needed. I am confident that this can be done.

The most difficult buildup required for this program will be management and labor trade skills in those yards with the proper facilities. Hiring and in many cases training new workers will be essential to this program.

The expansion of the Navy shipbuilding program is a formidable, but not insurmountable problem. It will require the proper utilization of those resources that are specialized or limited. Navy shipbuilding is also supported by other industries nationwide for electronics, marine equipment, engines, valves, and other products, materials and services procured by either the Navy or the shipbuilder. It should be stressed that the value of the work accomplished in the shipyard is often not the majority of the total systems cost.

For complex, high technology ships such as the CG 47 AEGIS Cruiser Class, for every dollar spent in the shipyard, one and a half dollars are spent with the supporting industries for the ordnance, the sensors, the computers and other highly sophisticated technological equipment that comprise a modern ship.

This supporting industrial base has also suffered from low and volatile levels of workload and diversified their product lines. If these suppliers view program size and continuity as a long range commitment, they are likely to re-enter the market. With a larger fleet to build and maintain, expanded output from the supporting industry may be anticipated.

Proper supervision of the range of activities connected with the Administration's increased shipbuilding program will require the dedication of additional technical and managerial resources both in Headquarters and in the

Supervisors of Shipbuilding offices in the field. Although it is evident that substantially increased numbers of personnel will be needed, we are carefully studying that requirement. We will unquestionably need more people to get the job done.

I would now like to discuss the role our public yards have played in the past and will play in the future.

Chart #18 There are eight public shipyards which overhaul and repair, and to a limited degree, conduct conversions of our complex naval ships. Six of the naval shipyards are capable of performing nuclear work.

Naval shipyard employment decreased from 67,717 at the end of FY 1979 to 67,483 at the end of FY 1980 principally due to OSD directed reductions to end strengths and the Leach Amendment to the Civil Service Reform Act of 1979 which limited federal employment to the level at the end of FY 1977. This amendment applies through the end of FY 1981. The current employment ceiling is stable at 67,529 for FY 1981.

Chart 19 shows average employment in naval shipyards since FY 1961. Notice a slight trend upward since FY 1974 in support of increased Congressional appropriations. Unfortunately, program requirements have grown faster than ceiling, particularly during the last two years.

Due to the very specialized skills required, the public shipyards have overhauled the very complex surface combatants, such as carriers, cruisers, destroyers and frigates. Surface ships of lessor complexity have been overhauled in the private yards due to their similarity to commercial ships.

In recent years, as new and more complex ships enter the inventory and as existing ships are being upgraded to meet the increasingly sophisticated threat, the private sector is also being tasked to overhaul ships of greater complexity. Recent additions of complex ships to the private secto workload include 1200 PSI steam system destroyers, FF 1062 Class ships and DD 963 Class ships. Prior to FY 1979, most of these ships were overhauled in the public sector.

Traditionally, the public yards have received no more than 70% and the private sector has received at least 30% of the funds provided for depot maintenance. Although the number of ships that are scheduled for overhaul in any one fiscal year may vary from year to year, the split is maintained by the assignment of ship types between the public and private sectors.

Recent trends in the ship overhaul program reflect problems in both schedule performance and work quality. Both public and private yards need to improve. We have initiated many actions that are leading to improved performance in both sectors.

For the maximum results with any workload, we need balance in workload/workforce ratios. In other words, level work assignments and stable employment. Unfortunately, these ingredients are not always common in the business of supporting our fleets. Public yards, as an example, have to respond to emergent situations, maintain capacity and meet schedule demands often in the face of hiring freezes of low personnel ceilings. These constraints which are not related to the program Congress authorizes, often result in schedule disruptions.

The primary reason for schedule extensions in the public sector is a stable ceiling while program requirements increase. To minimize this problem, ships that can be moved to the private sector have been so assigned. The late completion in the private sector is an indication that we have strained their capability also.

CHART 18

PUBLIC SHIPYARDS

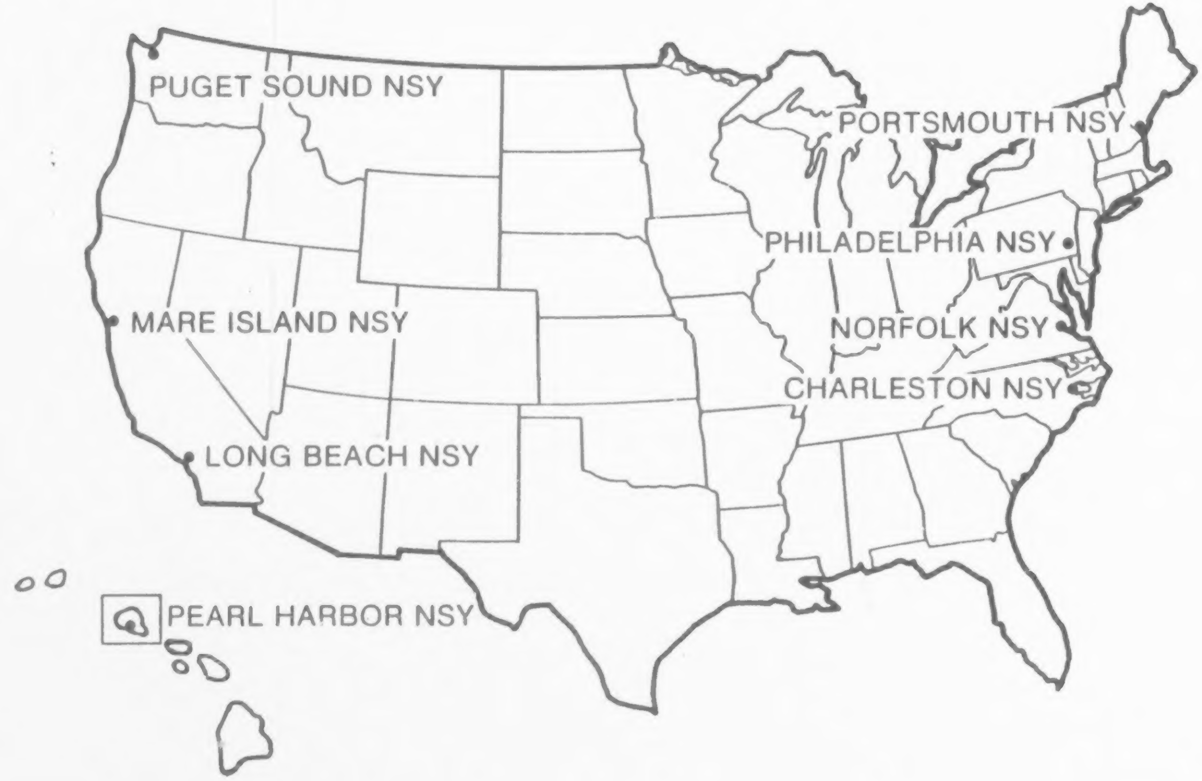
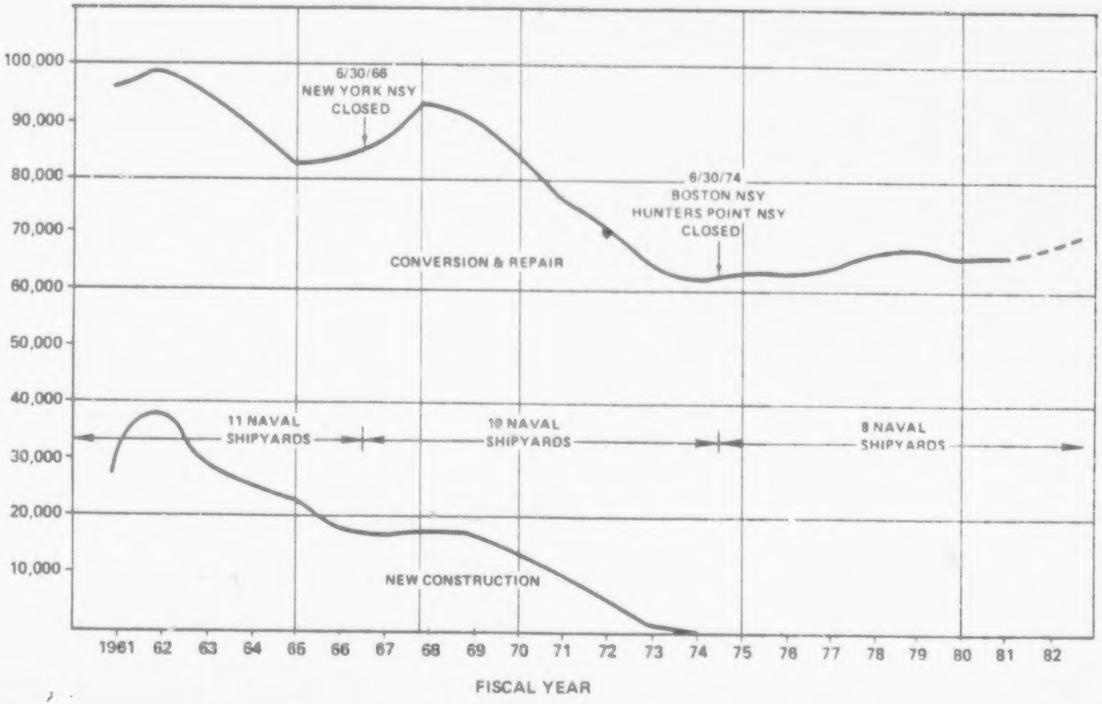

PUGET SOUND NSY
PORTSMOUTH NSY
PHILADELPHIA NSY
MARE ISLAND NSY
NORFOLK NSY
CHARLESTON NSY
LONG BEACH NSY
PEARL HARBOR NSY

CHART 19

AVERAGE TOTAL EMPLOYMENT ALL NAVAL SHIPYARDS



NEW CONSTRUCTION IN NAVAL SHIPYARDS

THE VINSON-TRAMMEL ACT

"...THE FIRST AND EACH SUCCEEDING ALTERNATE VESSEL SHALL BE CONSTRUCTED IN THE GOVERNMENT NAVY YARDS: PROVIDED, THAT, IF INCONSISTENT WITH THE PUBLIC INTERESTS IN ANY YEAR TO HAVE A VESSEL OR VESSELS CONSTRUCTED AS REQUIRED ABOVE, THE PRESIDENT MAY HAVE SUCH VESSEL OR VESSELS BUILT IN A GOVERNMENT OR PRIVATE YARD AS HE MAY DIRECT."

CHART 20

The Vinson-Trammel Act of 1934, as amended, specifies that the lead warship of a class and each succeeding alternate ship be built in a naval shipyard unless specifically exempted by Presidential authority for each program year. Every year since 1967, the Presidential determination has been to construct all ships in private yards.

DELIVERIES BY NAVAL SHIPYARDS
NEW CONSTRUCTION SHIPS
1959

	PHILADELPHIA	PORTSMOUTH	PUGET	MARE ISLAND
1958		1SSG,1SSN		1SSN
1959		1SS,1SSN		
1960			1DDG	1SSGN
1961	2DDG	1SSN,1SSBN	1DDG,1LPH	1SSN,1SSBN
1962	1LPH			2SSN
1963	1LPH			2SSBN
1964		1SSN,2SSBN	1CG,1AOE	2SSBN
1965	1LPH		1AS	1SSBN
1966				1SSBN
1967		1SSN	2CG,1AD	
1968			1AD	1SSN
1969	1LPH,1LST	1AGSS,1SSN	1AOE	
1970	2LST		1AOE	
1971	1LCC	1SSN		2SSN
1972				2SSN

CHART 21

In previous years, four naval shipyards have been engaged in new construction: Philadelphia, Portsmouth, Puget Sound and Mare Island. Several different types of ships have been built by these yards over the years. The last ships delivered were two SSNs built by Mare Island in 1972. These yards remain active in fleet maintenance and overhaul work as discussed earlier. With this background in new construction, they also represent potential alternative sources if needed.

We have recently completed an analysis of the shipyard base for attack submarine construction. This analysis has led me to conclude that three submarine construction shipyards are needed in the United States if we are to build and maintain a submarine force level of 100 ships. The Mare Island Naval Shipyard is the most favorable alternative, but two other public shipyards and two private shipyards might be considered with decreasing desirability in the order stated. The first submarine of the start of the new construction yard could be one of the FY 1982 SSN 688 Class ships, but the added cost would be at least $58 million FY 1982 one time startup cost, an additional $145 million later to improve facilities for efficient production and an increase in FY 1982 end cost of the lead ship of about $300 million to cover lead startup costs (learning curve). Further, other commitments are necessary to make the third yard successful, which is essential, including the long term plan to continue construction at a rate of at least one submarine per year and about 7,500 ceiling increase for naval shipyard employment. The ceiling increase is required, about 5,500, for the construction yard and about 2,000 for other public yards which receive the overhaul work offset by the new construction.

SUMMARY

The FY 1982 shipbuilding program will require greater utilization of the shipbuilding industrial base than we have seen in recent years. We are seeking additional means to utilize the industry more effectively and to reduce the cost and duration of naval ship construction. There are two issues which I would like to bring to the attention of the Committee which would improve facilitate accomplishment of the shipbuilding programs in future years.

First, in the area of contracting authority, the Defense Industrial Base Panel of the House Armed Services Committee has recommended some changes in their report "The Ailing Industrial Base: Unready for Crisis". I strongly support these changes. Specifically, the report recommends repeal of Section 810 of the Defense Appropriation Act of October 7, 1975 (PL 94-106; 89 Stat 539) which would remove the existing $5 million ceiling on cancellation costs applicable to multiyear defense procurement contracts. This recommendation and changes in advance procurement policies are positive steps toward a more efficient use of the industrial base.

Second, the orderly execution of the shipbuilding program is dependent upon the coordination of ship programming with funding in the RDT&EN appropriation for the ships' designs. The FY 1981 RDT&EN appropriation supplemental request includes $30 million for design funds to support the ships included in the Administration's amendment as well as those previously appropriated. Similarly, $90.6 million is included in the FY 1982 RDT&EN request, as amended, for design funds to support future shipbuilding programs. These funds are requested in advance to enable the Navy to prepare the contract packages required to award ships in the year in which they are appropriated.

As I stated earlier, the status of the current shipbuilding program is good with the exception of submarines. We are working on the submarine problem and it should improve. Looking to the upcoming years, I believe that the shipbuilding industry is capable of building and supporting the FY 1982 program and the 600 ship Navy that is the goal of this Administration.

BIOGRAPHICAL SKETCH

VICE ADMIRAL EARL B. FOWLER, JR., USN

Earl B. Fowler, Jr., was born in Jacksonville, Florida, on September 29, 1925, son of Earl B. and Veva Carpenter Fowler. He enlisted in the Navy V12 program and entered Georgia School of Technology in July 1943. In February 1946, he graduated with a B.S. degree in Mechanical Engineering and was commissioned Ensign, U.S. Naval Reserve.

His first duty was aboard the USS COLUMBIA (CL-56). Thereafter he served in USS RANGER (CV-4) and USS WRIGHT (CVL-49).

After graduation from Massachusetts Institute of Technology in January 1949 with a B.S. degree in Electrical Engineering, he was assigned to USS LEARY (DDR-879). He then served at the Naval Shipyard, Charleston, South Carolina, and on COMINELANT staff.

Vice Admiral Fowler served at the Navy Radiological Defense Laboratory, San Francisco, and Hunter's Point Naval Shipyard. After two years as Material and Engineering Advisor in the Military Assistance Advisory Group, Republic of China, he served on COMSERVPAC Staff at Pearl Harbor, Hawaii.

In September 1965, he was ordered to the Pacific Missile Range, Pt. Mugu, California, as Head, Ship Engineering Division, working on the design of ships for the Apollo Program and National Range Support.

Vice Admiral Fowler came to the Naval Material Command July 1967 as Project Manager, Instrumentation Ship Project Office, PM-5. He then became Project Manager, Oceanographic, Mine Patrol and Special Purpose Ship Acquisition Project. He attended the Harvard University Advanced Management Program during the fall of 1971.

In January 1972, he reported to the Naval Electronic Systems Command as Deputy Commander for Material Acquisition. Promoted to Rear Admiral on August 1, 1974, he served as Vice Commander until June 30, 1975, and as Commander from August 31, 1976 to March 21, 1980. He was promoted to Vice Admiral and became Commander, Naval Sea Systems Command, on March 31, 1980.

He was awarded the Meritorious Service Medal for outstanding meritorious service as Project Manger, Oceanographic, Mine Patrol and Special Purpose Ship Acquisition Project. He was also awarded the Legion of Merit for meritorious service as Commander, Naval Electronic Systems Command. In addition, he has the American Theater Medal; World War II Victory Medal; Occupation Medal (Europe); and the National Defense Medal with star.

Vice Admiral Fowler is a member of Delta Tau Delta, Georgia Tech; Pi Tau Sigma Honorary Mechanical Engineering Fraternity, Institute of Electrical/Electronic Engineers and the American Society of Naval Engineers.

Vice Admiral and Mrs. Fowler, the former Helen Marie Jorgensen of Sioux City, Iowa, reside at 1008 Dalebrook Drive, Alexandria, Virginia. They have two children, Mary Helen and Joan Ann.

COST TO REACTIVATE "ORISKANY"

Admiral **Rowden**. Mr. Chairman, I am prepared now to take your questions with regard to the ship request, sir.

Senator **Stevens**. Well, I am interested obviously in the battleship. As I understand it, the authorizing committee has denied at least the 1981 funds for the *Oriskany*. Now, you are assuming in this that there would be funds in the 1982 budget for the *Oriskany;* is that right?

Admiral **Rowden**. Yes, sir. In this request we are requesting funds in both 1981 and 1982 for the *Oriskany*. In 1981 we are requesting $139 million in advance procurement and in 1982 the balance of the total of $503 million or $364 million.

Senator **Stevens**. Where did you get those figures? Have you actually had a firm survey of that carrier to determine how much it is going to cost to put it back into good condition?

Admiral **Rowden**. These are class F estimates, Mr. Chairman. We wish they were better than this, but they are still class F. The ship has been inspected by the Board of Inspection and Survey. We have scoped the work necessary to bring the ship back to service. That is the rigor of the $503 million estimate.

Senator **Stevens**. What is the outyear impact of reactivating the *Oriskany?* What is it going to cost to man it and what is it going to cost to run it?

Admiral **Rowden**. May I defer to Admiral McDonald on that?

Admiral **McDonald**. Mr. Chairman, Admiral Rowden has discussed the costs that we perceive based on the best estimates that we have today. These costs are provided by the PERA (CV) group at Bremerton, which works this kind of carrier estimations and repair activities, and also by the Naval Sea Systems Command. Admiral Fowler's people have looked at the ship and tried to come up with the best estimates that they can on cost.

We feel relatively comfortable with that estimate. We do the same thing with the carriers that are going to go into complex overhaul. You have to look at the machinery and open to inspect some equipment in some cases to get the best estimate that you can.

In the case of the *Oriskany,* we are talking about $518 million total with $15 million of that in R. & D. We feel that this is a reasonable estimate. We feel that we would "box it" in time and also in dollars to accomplish what we would hope to do in bringing that ship back into service in approximately 34 months.

Time: 12 months for planning, 22 months for reactivation which is the cutting and bending and upgrading of the ship as we bring it back into activation itself.

We estimate that the number of people that are involved, is 2,085 enlisted people and 122 officers to run the ship. I believe that is the exact number. There also will be a little over 1,000 people in the air wing.

The air wing, as currently envisioned, will be composed of A-4M's manned by marine pilots in the marine air wing itself. So there would be no additional manpower required to man the air wing to put aboard that ship. We are talking to roughly 2,100 Naval officers and enlisted personnel to man the ship and run it.

"ORISKANY" CAPABILITIES

Senator **Stevens**. What about the serviceability? Will that be an all-weather aircraft carrier?

Admiral **McDonald**. Yes, sir. It will not have all-weather capabilities as far as the air wing is concerned.

Senator **Stevens**. That is what I am talking about. Obviously it will float in all weather but can it handle the air wing in all weather?

Admiral **McDonald**. No, sir, nor is it envisioned to do that. With the A–4 Mike aircraft you have a light attack non-all-weather capable airplane. We are looking at something between 48 and 55 aircraft. You can adjust the wing structuring to that particular size. The airplane is a clear airmass attack airplane, similar to the A–7A or B. I personally think that it is better than the A–7A and B. It has an upgraded engine in it. It can also be used as a fighter complement to the F–14 and provide some air-to-air fighter capabilities. It does not have an air-to-air radar in the airplane, so therefore it is a clear airmass fighter.

We envision using *Oriskany*, however, in a concept of operations so that it would be married with another carrier. If you are forced into a *DEFCON* situation in a wartime scenario, it would operate under the umbrella, if you would, of something like the *Kennedy* or the *Eisenhower* or one of the other bigger carriers which would provide the fighter protection for the ship, the all-weather attack capabilities of the battle group, the early warning for the battle group and the other support functions.

So the *Oriskany* would be a platform whereby we could place between 50 and 60 airplanes, that are tactical at-sea-bombers, light attack bombers, at sea to augment our current forces.

RANGE OF LIGHT ATTACK BOMBERS

Senator **Stevens**. What is the range of those light attack bombers?

Admiral **McDonald**. It depends on what they are carrying, Mr. Chairman, of course, but it is would be similar in range to the scenario that we fought in Vietnam. We are probably talking 300 miles on an Alpha strike which is about what you would do with the A-7's. It is about the same as any of our light attack aircraft capabilities in the fleet today.

Senator STEVENS. How much protection would you have to give that in terms of that battle group, the fighter cover?

Admiral McDONALD. You would have to provide the same protection that we do with the battle group now where you have your F-14's up on combat air patrol stations to intercept incoming bombers or other strike aircraft. It just means that those attack aircraft would have to fit into the role wherein they would actually complement the attack aircraft on the other carrier. You are actually increasing the striking force that you would use in any kind of a wartime scenario wherein you would use a light attack airplane.

DEACTIVATION OF "ORISKANY"

Senator STEVENS. How long has that carrier been in mothballs.

Admiral McDONALD. It went in, in 1976, sir. She went out of commission, I believe, in 1975 and went into the mothball fleet in 1976.

Senator STEVENS. She has been in there before though, hadn't she, the *Oriskany*? Was that the first time in mothballs?

Admiral McDONALD. That is the first time, sir.

Senator STEVENS. During this period, has the Navy asked for any nuclear carriers in the same period of time?

Admiral McDONALD. We have CVN-70, the *Vinson*, coming but I think that was funded before *Oriskany* came up. CVN-71 was requested after *Oriskany* had gone into overhaul and this carrier is due to come into the fleet in 1988.

Senator STEVENS. The *Oriskany* burns bunker fuel I assume?

Admiral McDONALD. That is correct, sir.

Senator STEVENS. And the decision was made at some time to put her in mothballs and go into a new technology as far as nuclear carriers?

Admiral McDONALD. Yes, sir. I think that given the capabilities of the ship at that time, examining what our demands were and what our operational commitments were, the decision was to draw-down on the 27 Charlies, the smaller class carrier, and to go for the larger class carrier.

RETIREMENT OF "ORISKANY"

Senator STEVENS. Was there a hearing about the time you retired or put the *Oriskany* into mothballs? It seems to me that I remember something in terms of some discussion here in this committee about the *Oriskany*. Who made the decision to retire the *Oriskany*? Did the Congress tell you to retire it?

Admiral McDONALD. No, sir, I think that was a Navy decision, but I will check and provide it for the record. I do not have the historical litany on that but I will check and provide it for the record. I feel confident that the decision to retire and put *Oriskany* in mothballs was a Navy decision at that time.

[The information follows:]

DECISION TO RETIRE "ORISKANY"

The decision to retire the *Oriskany* was made by the Office of the Secretary of Defense. It was a result of a decision to reduce carrier force level.

"ORISKANY" CHARACTERISTICS

Senator STEVENS. What is its armament?

Admiral McDONALD. Its air wing.

Senator STEVENS. I know, but has it any special protection or any special armament as far as its class is concerned?

Admiral McDONALD. Yes, sir. It has the armor that a 27 Charlie class carrier had. They were built, as you may recall, just at the termination of World War II. They have relatively good magazine protection and protection along the waterline. That class ship does have good protection. Some improvements that have gone into it have driven it from about a 30,000 ton ship up to about a 42,000 ton ship.

Senator STEVENS. What is its speed?

Admiral McDONALD. Thirty-plus knots, sir. It is comparable in speed to the carriers we are operating in today's Navy. We really have never changed the speed dramatically. We haven't had a breakthrough on upper speed limits.

Senator STEVENS. What is its fuel capacity, do you know? How long can she stay at sea without being refueled?

Admiral McDONALD. Under normal operating conditions, those that we were operating in in the Gulf of Tonkin off of Vietnam where *Oriskany* was last operating, she was about a 3-day operator without refueling and about the same amount of time for ammunition and other types of replenishments such as food.

Admiral ROWDEN. But we point out, Mr. Chairman, on the fuel that we ordinarily fuel our ships when they get down to about 60 percent; liquid load being a very critical thing in stability. So we wouldn't want to leave you with the idea that she is out of fuel at that time. It is prudent to refuel every 3 or 4 days.

Admiral McDONALD. More critical are the aviation fuels that are transferred at that same time with the black oil, because you are burning aviation fuel more quickly than you are the DFM for the ship.

OPERATIONAL ROLE FOR "ORISKANY"

Senator STEVENS. Now, is there any proposal to convert to a new role that she didn't have at the time she was previously in service. Will she have any different role than she had before. I mean the battleships, you are going to propose to put cruise missiles on them. Is there any difference in the operation planned for the *Oriskany* compared to its previous service?

Admiral McDONALD. Yes, sir. We want to investigate using *Oriskany* as we start moving toward V-STOL. We could use *Oriskany* as a platform to do some different types of carrier development on her. There is the possibility that we might look at putting a Ski Jump on *Oriskany,* although that is not the primary reason for bringing her back.

Senator STEVENS. Do you have any other platform that could do those operations, either V-STOL or Ski Jump?

Admiral McDONALD. Not without getting into the force structures we have right now. *Oriskany* has basically the same landing area as some of the less-than-large carriers that we are talking to.

Senator STEVENS. Would she be the largest carrier you have if she was refloated?

Admiral McDONALD. No, sir. She would be the smallest.

Senator STEVENS. The smallest.

Admiral McDONALD. Yes, sir. She will be about 42,000 tons. The next class is the *Coral Sea* and the *Midway,* about 65,000 tons.

PREVIOUS PROPOSALS TO REACTIVATE BATTLESHIPS

Senator STEVENS. Let's go to the battleships. Wasn't this proposed once before that those battleships be brought out of mothballs?

Admiral ROWDEN. Last year, Mr. Chairman, they were added by the Congress in the discussions of the authorization last year. As you recall, the battleship, the first one, the *New Jersey,* was authorized last year but not appropriated for.

We reactivated the *New Jersey* in April 1968. She was in commission for a little over a year and went back out of commission in December 1969.

Senator STEVENS. Have you got any studies to show what it would cost to put her back into service before?

Admiral ROWDEN. Yes, we do. Of course, much of our projections now of the cost to bring her back into commission now is based on escalated prior costs.

ELECTRICAL SYSTEMS IN BATTLESHIPS

Senator STEVENS. Don't you use an entirely different electrical systems now in your vessels? The modular system can be replaced with totally new concepts of electrical systems?

Admiral ROWDEN. No, sir. The electrical systems that are in the ship now are of three types. One is that straight 60 cycle, 110 volt current as we have here for the lights; there is a 440 volt system which is heavier 60 cycle current used for big motors and other heavy equipment and then there is 400 cycle power that we use in a number of control systems. There is not a great deal of 400 cycle power in the battleships. They primarily have 60 cycle heavy electrical equipment, but it is distributed by wires in the same fashion as now.

Senator STEVENS. Don't you use solid state now?

Admiral ROWDEN. We have solid state equipment and that is where the 400 cycle power comes in. The *New Jersey* operates on 60 cycle power, both 440 and 110, and that is not uncharacteristic of the way we power our ships electrically now.

AVAILABILITY OF EQUIPMENT FOR BATTLESHIPS

Senator STEVENS. Have you gone into the question of who made the electrical and who made the mechanical portions of the *Oriskany* at the time she was originally built? Is it possible to get resupply now on the market?

Admiral ROWDEN. The *Oriskany* or the battleships?

Senator STEVENS. Pardon me, the battleship *New Jersey.*

Admiral **Rowden**. I am going to let Admiral Fowler talk in a minute on that because he is much closer to that sort of thing than I am. We do understand how she was build and we understand the machinery that is in her. Now all of it is in productin obviously now, pumps and that sort of thing there. Replacement for those can be made.

In the electrical system I don't know of any replacements or unserviceable equipment that can be replaced there. Can you comment on that?

STATEMENT OF VICE ADM. EARL B. FOWLER

Admiral **Fowler**. We think we can handle it, Senator. The obvious area where we will have to do some modernizing is in the communications equipment and the radar, which of course will have to be replaced. Radar replacement is required on the basis of both modern technology and superior modern operational characteristics. We are trying to take care of all these factors as we proceed with the Navy's activation and modernization effort.

CERTAINTY OF COST ESTIMATES FOR BATTLESHIP

Senator **Stevens**. Now, is this the F classification estimate, too, for the battleship?

Admiral **Fowler**. Yes, sir.

Senator **Stevens**. When was it made? Are you relying on the one that was made for the proposal that was before us last year?

Admiral **Rowden**. Yes, sir, with updating for escalation between then and now and some changes in characteristics. For example, the original request included a missile system called NATO Sea Sparrow. It is short-range, approximately a 10-mile missile system. We have deleted that from the ship.

We have included more armored box launchers now than we had last year, four more, and they carry 4 missiles each, and we have included a replacement for the air search radar that Admiral Fowler mentioned. We are including a slightly larger aviation facility aft than the ship had when she was recommissioned. She had a single helo spot aft of turret No. 3. We want to put on between 2 and 4 helo spots back in that area.

WARSHIPS CURRENTLY IN MOTHBALLS

Senator **Stevens**. What vessels do we now have in mothballs? Do we have any cruisers?

Admiral **Rowden**. Yes, sir. We have six cruisers at the present time in mothballs. Three of them are gun cruisers, the *Salem*, the *Des Moines*, and the *Newport News*. They are all three at Philadelphia. They are 8-inch gun cruisers. *Salem* and *Des Moines* are new in terms of chronological life. In other words, they have been in mothballs for quite a period of time. *Newport News* was in action during the Vietnam war and put out of commission toward the end of that war.

There are three guided missile cruisers that are in mothballs at the present time. First is the *Oklahoma City*, which is on its way to becoming a museum and not terribly serviceable. She was a light cruiser. Then there are two heavy guided missile cruisers, the

Albany and *Chicago*. *Chicago* is on the west coast and *Albany* is down in Norfolk. They are not gun cruisers. They are guided missile cruisers which employ an obsolete system called Talos and another present day system called Tartar.

Senator STEVENS. What other vessels do you have in mothballs, any lighter than that?

VESSELS CURRENTLY IN MOTHBALLS

Admiral ROWDEN. I think that we have no more destroyers in mothballs at all. I will check that for the record, but I believe that there are none in mothballs. Years ago of course there was quite a number but they have been disposed of.

Admiral FOWLER. There may be one or two that we are in the process of transferring.

[The information follows:]

LIGHT SHIPS AVAILABLE FOR MOBILIZATION

There are currently no ships lighter than those mentioned above being maintained as mobilization assets.

CONDITION AND CHARACTERISTICS OF BATTLESHIPS

Senator STEVENS. The theory of taking the battleships out of mothballs, it becomes a cruise missile launching platform over the horizon; is that right?

Admiral ROWDEN. Yes, sir. There are several points with regard to it.

The ships are relatively new chronologically, as I mentioned about the cruisers.

Senator STEVENS. When was it built?

Admiral ROWDEN. The *New Jersey* was built in 1943, but she has been operated only about 12 years. The average operation time for all four is 10.7 years. I believe the minimum one was operated about 7 years and the maximum was operated about 13. So that is the scope. We operate ships about 30 years. So the plants haven't been run that much.

Now, I point out that the steam plant in that ship is the same steam plant that we have in AOE's. AOE's are big, multipurpose replenishment ships which operate in the battle group.

So we are not talking about an engineering plant that is foreign to the Navy at the present time. It is a 600-pound steam turbine plant. We have 600-pound steam turbine plants, for example, in the LHA's, a reasonably new ship. So you have a platform that is a relatively young one and one that is in keeping with the way we operate ships today in steam engineering.

The second point is that it is a very durable ship and a very rugged ship. It is heavily armored and is by most accounts the most rugged ship that has ever been built. So we have a very, very tough ship that is able to withstand punishment. That doesn't mean that the ship is unsinkable because no ship is unsinkable. But the construction of this particular ship is such that she can take much more punishment than any other ship that we have at the present time.

Senator STEVENS. From 16-inch shells.

Admiral ROWDEN. Or cruise missiles.

Senator **Stevens**. Or cruise missiles?

Admiral **Rowden**. Yes, sir.

CRUISE MISSILE HITS ON BATTLESHIPS

Senator **Stevens**. Have we ever had a battleship hit with a cruise missile?

Admiral **Rowden**. No, sir, we have not because we have never had a battleship operating in an environment of cruise missiles.

Senator **Stevens**. Did you ever hit anything similar to a battleship with a cruise missile?

Admiral **Rowden**. We have fired cruise missiles at targets, yes, sir.

Senator **Stevens**. With 16-inch armor?

Admiral **Rowden**. No. Destroyers primarily. They really make a mess of a destroyer with a cruise missile hit. The idea of the armor is to defeat the damage.

Another property of the ship is that it is big and able to carry a lot of things. That is where the installation of cruise missiles onboard comes into play.

It seems to me that when we think of the relevance of a battleship we must think of it in terms of the way we employ naval forces today and not the way naval forces were employed in the 1920's and the 1930's when the battleships were in vogue. Then the tactic was to slug it out toe to toe with large caliber guns and he who survived lived to fight another day.

Now we talk more about long-range strike. And in order to make this ship relevant for long-range strike we have to do at least two things, Mr. Chairman. One, we have to get cruise missiles onboard with a range of the longer ranges, several hundred miles.

The second thing that we need to do is introduce naval aviation in a relevant fashion. I mentioned the helo spots aft. The ship now of course is acceptable for a vertical takeoff and landing aircraft. We would plan ultimately to go to a ski jump type deck and V-STOL aircraft. We don't feel that we can do that initially because the development isn't complete and that increases the cost and the time. There is a requirement to get these ships out to the fleet to stretch our forces now, the carrier forces that we have, in a relevant fashion.

CRUISE MISSILES ON BATTLESHIPS

Senator **Stevens**. Is the goal for these battleships to have a launching platform at sea for cruise missiles? Is that the real role that you expect the battleships to play?

Admiral **Rowden**. More than that, Mr. Chairman.

Senator **Stevens**. The range of the cruise missile is what? What is the range of your cruise missile, three or four thousand nautical miles?

Admiral **Rowden**. No. On the order of hundreds of nautical miles, three or four hundred nautical miles. You are thinking of the strategic missiles which are much longer range missiles.

Senator **Stevens**. I thought you were going to put much larger missiles on these battleships. Are you talking about the same size cruise missile as an air-launched cruise missile, that size?

Admiral Rowden. There are two sizes of cruise missiles which we are talking about. One is presently at sea in the ships that we have now. That is the Harpoon. That is a 13½-inch diameter missile. It is a missile on the order of 160 or 170 inches long. It weighs about 1,600 pounds and it is a 60-mile missle. We would put that onboard the battleship.

Senator Stevens. Sixty miles?

Admiral Rowden. Sixty miles, yes, sir. That is a development that we have had going on over the last several years. As I said, Harpoon is installed now in a little over 100 ships in the Navy.

Senator Stevens. Well, that is not really exactly over the horizon.

Admiral Rowden. Yes, sir. The horizon is at about 20 miles. So it very definitely is over the horizon.

In addition to Harpoon there is the Tomahawk missile which is a 21-inch missile and 242 inches long. That is the one that you mentioned which can be launched from aircraft which is about a 2,500-pound missile. It carries a larger warhead, twice the size of the Harpoon and it has a much longer range.

Effective range depends, Mr. Chairman, whether it is a conventional or a nuclear warhead. It depends on whether it is used against shore targets or used against a ship. They utilize different kinds of guidance mechanisms. They are two different things. So there is a set of ranges that are associated with employing it at sea and there is another set of ranges which are longer which associate themselves with employing it ashore, both of which we know how to do and both of which we have demonstrated.

Very definitely that ship would be used as a launch platform for those kinds of missiles. At the same time we intend to get both of those kinds of missiles into our DD-963's and into our CG–47 class ships to diversify the strike capability.

DEPLOYING CRUISE MISSILES ON SURFACE SHIPS

Senator Stevens. How much diversity do you have if you have two battleships? Why can't you look at your existing fleet and put those cruise missiles on your existing fleet?

Admiral Rowden. You can, Mr. Chairman. But we are talking about the size of the ship. You can't put the numbers that we are talking about in anything but a battleship. We [deleted] put [deleted] missile holes, vertical missile holes, in a [deleted].

Senator Stevens. You can put the same amount on 10 different ships.

Admiral Rowden. I am sorry, sir.

Senator Stevens. You can put the same amount on 10 different existing vessels.

Admiral Rowden. Yes; we can.

COST OF EQUIPPING ALL VESSELS WITH MISSILES

Senator Stevens. What would that cost? Have you looked at the alternative cost of putting missiles on every one of your existing vessels in your battle groups?

Admiral Rowden. Yes; we know what those costs are.

Senator Stevens. What are they? Have you got a record of them and can you let us see them?

Admiral Rowden. I can provide you a record of that. I can't off the top of my head.

Senator Stevens. I would like to see that. I just can't understand, if the theory is right, why we have got to put all of our eggs in two old baskets.

[The information follows:]

Distribution of Cruise Missile Firepower Throughout Fleet

In order to effectively distribute cruise missile offensive firepower throughout the fleet, and particularly within battlegroups, we are continuing to install the medium range Harpoon anti-ship missile system on nearly every class of surface combatant, and plan to deploy the long range Tomahawk anti-ship and land strike capability on selected existing and planned battlegroup capable ships. Since the increased Tomahawk capability necessarily entails larger launchers and more complex mission planning, targeting, and weapons control equipments it cannot readily be installed on every surface combatant. As such, we have selected DD 963, CGN, CG 47, and Battleship classes since these ships have the volume, support services, and adaptability to receive Tomahawk without incurring major structural, manning or mission impacts.

Specifically, by the end of calendar year 1982 all battlegroup capable surface combatants will be equipped with the Harpoon Weapon System at an average procurement and installation cost of $1.8M per ship [deleted]. The planned [deleted] Harpoon installation on Battleships, with redundant weapon control systems, is estimated at $4.0M per ship. The above costs do not include missile procurement.

Regarding Tomahawk, we are initially achieving this capability in fiscal year 1983 through the installation of the Tomahawk Common Weapons Control System and Armored Box Launchers (ABL) on all CGN and seven DD 963 class ships at an average procurement and installation cost of $20M per ship. Thereafter, as multipurpose high volumn Vertical Launching Systems become available in the mid-80s we plan to transition from ABLs to this launch system for at least the [deleted] remaining DD 963 ships and all new construction CG 47 AEGIS cruisers beginning with the fiscal year 1982 authorizations. The procurement and installation cost of a 61-cell Tomahawk-capable Vertical Launching System is approximately $52.0M per ship. It should be noted that this cost charges the entire launcher to Tomahawk, when in fact it will be capable of launching any type of vertically-adapted missile, such as SM 2 and ASROC. The planned Battleship Tomahawk installation will include [deleted] four-cell Armored Box Launchers for [deleted] dedicated Tomahawk cells and a slightly expanded Common Weapon Control System at an estimated procurement and installation cost of $70.0M per ship.

The Battleship cruise missile configuration of [deleted] Harpoon and [deleted] Tomahawk missiles in ready-to-fire positions, along with her nine 16-inch guns, will permit sustained anti-ship and land strike offensive operations both independently as the core of a surface action group or in support of battle group operations. The Battleship, so configured, will serve as the most durable and formidable strike combatant afloat.

Thus, for the average per unit procurement and installation costs cited above, less missiles, all battle group surface combatants will be Harpoon capable by calendar year 1982, [deleted] Tomahawk capable by 1986 and 1990, respectively.

OPERATIONAL EFFECTIVENESS OF BATTLESHIP

Admiral Rowden. The size and ruggedness of the battleship and the ability to be able to operate an asset that we have make these ships attractive both from an operational and cost-effectiveness viewpoint.

COST OF MODERNIZING REACTIVATED SHIPS

Senator Stevens. It's too bad the others aren't here. We are very wary of this because of what we have just gone through in the modernization program in the Army. Things that cost us $27 million to initiate in 1980 are now up to $1,100 million roughly or even more in terms of a projection that was brought to us of $27 million. And now we are going to start a modernization program by refloating old vessels and putting new concepts on them.

Admiral ROWDEN. Yes, sir.

Senator STEVENS. I would hope you would give us a study before we have to vote on this bill that would show what would happen if we gave you the same amount of money and told you to put them on the vessels that are already in service.

Admiral ROWDEN. The problem, Mr. Chairman, with that is that we need additional ships. We have talked about going from a 12-carrier battle group Navy now, characterized as a 12-carrier battle group, to a 15-carrier battle group Navy. We need more ships, a diversification of forces and the ability to stretch these forces into more places in the world.

If we take what we have, we think that our ships ought to be armed and ought to be strike capable. But additional forces are also a goal and this is a way in the near term to get additional forces that are relevant.

IMPROVING COST ESTIMATES FOR BATTLESHIPS AND "ORISKANY"

Senator STEVENS. How much is it going to cost to make the study that brings it up to a class A or B estimate? What is it going to cost us now and what will it cost in the future to bring the *New Jersey* and the *Iowa* and the *Oriskany* out of mothballs? What will it cost for that study and how long would it take?

Admiral ROWDEN. Let me defer to Admiral Fowler.

Admiral FOWLER. We asked for $3 million in the 1981 R.D.T. & E. appropriation to get on with that kind of activity on the battleship and for $4 million to do a similar type of work on the *Oriskany?*

Senator STEVENS. Did the authorizing committee deny you the money for the study? It was the advanced procurement they denied, wasn't it?

Admiral ROWDEN. This is R. & D.

Senator STEVENS. What did the Senate Armed Services Committee deny you the other day with regard to the *Oriskany?*

Admiral ROWDEN. I believe that was advance procurement and SCN, sir.

Senator STEVENS. They didn't deny you the study money, did they?

Admiral ROWDEN. No, sir.

Senator STEVENS. Why aren't you making that study now? Are you making this study now?

Admiral ROWDEN. It has not been authorized.

Senator STEVENS. It has not been authorized?

Admiral ROWDEN. Yes, sir. It is before the Congress at the present time but in the R. & D. account and not in the SCN account.

Senator STEVENS. You don't have any general authority to examine into a proposal like this? You make the proposal before you make the actual hard dollar studies?

Admiral FOWLER. Senator, we have separated our design money in the R.D.T. & E. account from the SCN account so that often when we come forward to try to present ideas on new ships and new ship design we are very much constrained by the amount of money that we have in the R.D.T. & E. account.

ROLE OF BATTLESHIPS

Senator STEVENS. This is about the same as building new ships. I think you could get new ships out of this group faster than you could get these old ones refloated. We are going to really have to have some more detail I guess.

What role is the battleship going to play as a battleship under your proposal?

Admiral ROWDEN. We have talked about the cruise missile. The cruise missile employment is very important we believe. The role that it can play as a battleship is in employment of the 16-inch guns.

That comes in two areas, Mr. Chairman. One is in shore bombardment in support of the Marines in amphibious operations. The Marines are very, very high on this. Their experience in Vietnam showed this, as did their experience before that time in Korea and indeed in World War II. With the heavy fall of shot that the battleship provides in the 16-inch projectile there is no comparison in any other gun ship for support of amphibious operations.

Second, it has a relevance at sea. One can envision that not all engagements are going to be consummated over the horizon. There may be some close-in operations.

These are very valuable ships for the same reason, big, heavy fall of shot and range to over 20 miles in an engagement like that. So I believe there are two relevant roles for the battleship in her current configuration, if you will, employing the guns. In addition to that, she has 20 barrels of 5-inch onboard which are useful in a shore bombardment.

REQUIREMENT FOR BATTLESHIPS

Senator STEVENS. The Navy made the decision in 1976 to retire the *New Jersey*.

Admiral ROWDEN. Yes, in 1968.

Senator STEVENS. 1968.

Admiral ROWDEN. 1968 or 1969.

Senator STEVENS. We were involved in Vietnam then.

Admiral ROWDEN. Yes, sir.

Senator STEVENS. You didn't need it then.

Admiral ROWDEN. No, I wouldn't say we didn't need it.

Senator STEVENS. Well, you didn't decide to ask for it back.

Admiral ROWDEN. We didn't decide to keep her in.

Senator STEVENS. But now under the current conditions you feel you do need it?

Admiral ROWDEN. Yes, sir.

Senator STEVENS. Would you need it as a battleship without regard to the cruise missile?

Admiral ROWDEN. We should not bring her back as a battleship without the cruise missiles onboard. We should have the cruise missile strike capability associated with her. So the direct answer is no, sir.

DIVERSIFYING STRIKE CAPABILITY

Senator **Stevens**. I don't know about everyone else, but I am an absolute firm believer in the cruise missiles. I am also a believer that somehow or other you have to get some diversity in the launching platforms. It doesn't seem like there is going to be much diversity in launching platforms if we use two battleships as a principal launching area for the sea-based cruise missile.

We spend billions of dollars to hide these other missiles underground in the desert and here we are going to stick a battleship out in the middle of the Persian Gulf and announce to everyone where it is and how many cruise missiles she has on it. It will be the first target that you could possibly dream of if you are going to have a conflict.

Admiral **Rowden**. No, I think we are diversifying our strike capability. Our strike capability is presently resident in our strike carriers. We have programed to diversify the cruise missile strike capability into our destroyers and cruisers as well as in the battleship.

What the battleship gives you in that diversification is a concentration of power similar to our strike carriers.

Now, I certainly can't deny that it is a very lucrative target, but it is another very lucrative target beyond the nominal 12 big-deck attack carriers that we have at the present time. It expands that capability and provides us the offensive capability to concentrate power from that ship.

SHIPS REQUIRED TO BUILD UP THE FLEET

Senator **Stevens**. It would seem that it would require protection of the other vessels that might otherwise be employed at that time in being diversified as far as being cruise missile launchers themselves.

Admiral **Rowden**. In constituting the force with the battleship, it is constituted similar to the carrier battle group which requires AAW cruisers and ASW cruisers and destroyers.

Admiral **McDonald**. May I go back to the carrier for just a moment, Senator.

Senator **Stevens**. Yes, please do.

Admiral **McDonald**. You raised the issue of bringing back an old carrier and possibly that we should look to building new ones. We would like to do that. In the request this year there is $658 million long lead for another large nuclear carrier. We welcome that initiative in the Navy as we build towards 15-carrier battle groups.

But I would offer that the time of construction is very, very essential in this whole discussion in that even through 34 months, which is the best estimate we have for *Oriskany* reactivation, is considerably less than 7 or 8 years, which is the best time that we have as an estimate for any new carrier construction we are discussing.

If the 1982 appropriation, including that long long-lead request is funded for a new nuclear carrier, we will see that ship come into being in 1990. That is about the earliest that we can project at this time.

Whereas the *Oriskany,* albeit limited as compared to capabilities of a nuclear carrier, gives us tactical aircraft at sea at a time when the Soviet fleet is coming to sea in tremendous numbers to at least tamp down some of that threat in the near time frame.

Senator **Stevens**. But it postpones the time when we will have the same comparable fleet that they do because it is going to postpone the time when we build those replacement carriers.

Admiral **McDonald**. No, sir.

Senator **Stevens**. It will if the figures come in the way we all expect they will come in in terms of the cost of refloating them. That is why we would like to see this study of what is it really going to cost. These guesstimates are what we had before that led us into these billions of dollars of overruns.

I don't know. It just seems to me that we all agree that you need modernization and we are trying to play catch-up all the way across the board as far as the military is concerned. But, you know, this is like bringing out some old Patton tanks and trying to stick cruise missiles on them as far as our concept.

Now, we could be wrong, and I apologize if I am too blunt about it, but I just can't quite see if the Navy made the decision to retire these vessels why we have to bring them out now at a time when we are trying to really reconstruct our Navy rather than, you know, bring out the old ones, put bandaids on them and float it and think it keeps up with the Russians. I am not sure we have to keep up with the Russians as much as we have to plan for the future to be sure we can always beat the Russians.

Admiral **McDonald**. I am sure that I speak for Admiral Rowden, my contemporary in the surface warfare side, when I say we can agree completely with that statement. You are aware of our service life extension program for carriers, and I am dealing strictly with the carrier side now, where we have *Saratoga* in Philadelphia for a 28-month overhaul, that will extend her service life for 15 years. This is basically the same amount of time we would like to plan for in bringing *Oriskany* back.

We are not planning to bring *Oriskany* back only for 5 years. We are planning to bring her back for 15 years as a force builder. The cost of the Saratoga overhaul is $526 million. You are taking a 30-year ship and extending it for 15 years. unless you do this you won't have that ship.

FUNDS REQUIRED FOR COST STUDIES

Senator **Stevens**. Gentlemen, I do apologize, I have to go. Again, I would like to get back to this cost study though. You feel there is a prohibition in existing law that prevents you from reprograming money and getting us as quickly as possible an upgraded cost study on what this is going to cost us for the *Oriskany* and these battleships?

I think that what defeated us last year was the fear of cost overruns. I am not sure we are disagreeing with you as much on the policy as much as the fact that every time we do something like this is just costs us literally almost a hundred times what we are thinking about in the beginning numbers.

Now, what is the prohibition against using some money you have now to get us better numbers?

Admiral **Fowler**. The restricted R.D.T. & E. fund. We need the requested 1981 funds in R.D.T. & E. appropriations in order to get on with the design work so that we can make better cost estimates on both the battleships and the *Oriskany*.

Senator **Stevens**. There is a restriction in the law that you cannot use any of these funds?

Admiral **Fowler**. The funds are not available.

Admiral **Rowden**. It is before the Congress now in the 1981 supplementals.

Senator **Stevens**. Don't you have people on your payroll now that estimate the cost of this?

Admiral **Fowler**. Yes, sir.

Senator **Stevens**. Well then, why can't you reprogram money and put them to work to get those figures?

Admiral **Fowler**. We can either reprogram money or we can request the supplemental. It is in the 1981 supplemental.

Senator **Stevens**. How long is it going to take to get the accurate figures?

Admiral **Fowler**. It will take us a few months to make final decisions on what should be in the program. Once this is done, then we can begin to make good solid cost esimates.

Senator **Stevens**. We are not going to pass that supplemental until June. You are asking us to act on the 1982 before we get those estimates.

Admiral **Fowler**. The *Saratoga* will provide a good test case for the *Oriskany*. We are doing about $500 million worth of work in both ships.

Senator **Stevens**. Thank you.

Senator Rudman will continue to chair the hearing. I do hope, Senator, that you can go into some of these other vessels and see what problems we might have in terms of cost estimates and how realiable those estimates are with regard to the amended funding request.

SUBMITTED QUESTIONS

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

QUESTIONS SUBMITTED BY SENATOR STEVENS

Navy Plan to Accommodate Increased Shipbuilding

Senator Stevens The amended budget request indicates that the Navy shipbuilding program includes 33 ships costing $10.2 billion. This is in contrast to the January budget request of 18 ships and $6.6 billion. What is the Navy's plan for this increase in shipbuilding and conversion as compared to the Fiscal Year 1981 program?

Admiral Fowler: The expansion of the Navy shipbuilding program in Fiscal 82 is within the capability of the shipbuilding industry. It will require the proper utilization of those resources that are specialized or limited. The large T-ships and reactivations require large drydocks, pier space and a reasonable employment level. We will ensure, by judicious source selection, that necessary facilities are available when and where needed and that they are capable of manning and managing the effort.

BATTLESHIPS

Chairman Stevens: There has been special interest in the amended budget request concerning the recommissioning of two battleships. Also, there has been an expressed opinion that rather than two battleships being commissioned, cruisers in mothballs would be a better choice for recommissioning. These two examples of having ships in mothballs which the Navy could recommission into the active fleet makes one wonder why they were put in mothballs in the first place. Would it have been prudent for the Navy to have continued to operate ships such as the battleships and cruisers rather than putting them into mothballs?

Admiral Rowden: Neither the battleships nor the cruisers are viable Fleet assets with the current combat systems alone. However, modern technology provides the opportunity to add capabilities such as HARPOON and TOMAHAWK cruise missiles, the VULCAN PHALANX close-in weapon system, and state-of-the-art electronics which will make a significant contribution to combat readiness. The major caliber guns continue to be a much-needed asset for amphibious operations.

The Navy prefers the IOWA-class battleships because of their superior survivability features, the increased range of the 16"/50 guns, and, most importantly, the operational advantages available with four battleships vs only two cruisers. In specific response to your question, it would not have been prudent to retain these ships in active service as presently configured, but they represent an attractive alternative for an economic, near-term addition to naval forces until planned shipbuilding programs produce the requisite numbers of ships and capabilities to meet the current threat.

BATTLESHIPS

Chairman Stevens: Also concerning the battleships and cruisers, why have they become so attractive at this time when they apparently were not considered by previous administrations?

Admiral Rowden: The recent build-up in the Indian Ocean has stretched already over-extended naval forces to the point that we are meeting three-ocean commitments with a one and one-half ocean Navy. Among several options considered in an effort to provide some relief from this unsatisfactory solution, the battleships offer an attractive alternative, at reasonable cost, which can be available for service as early as 1983. The Chief of Naval Operations proposed reactivation of the four IOWA-class battleships in February 1980, but the initiative was not supported by the previous administration.

600 SHIP NAVY

Senator Stevens: The Secretary of the Navy said Monday in his testimony before this Committee that his objective was to increase shipbuilding up to the range of approximately 30 ships per year in order to achieve a 600 ship Navy consisting of 15 battle groups. How long will it take to achieve a 600 ship Navy?

Admiral Rowden: Senator Stevens, details of a shipbuilding program which will reach the near-term and long-term goal of 600 ships are being developed.

Senator Stevens: How many and what types of ships will be required to attain a 15 battle group force?

(C) Admiral Rowden: Reactivation of ORISKANY and the battleships will help us build to a force of 15 deployable battle groups [deleted]. Constructing another large-deck carrier starting in 1983 will permit us to retain a force level of 15 large-deck carriers into the 1980s. However, additional cruisers, destroyers, mobile logistic support force ships, and submarines will also be required.

Senator Stevens: How many and what types of ships will need to be procured each year to reach the Navy's objective?

Admiral Rowden: New construction cruisers and destroyers will need to be added to provide more individual unit capability as well as numbers. We would also plan to build four attack submarines each year. Expanding amphibious lift capability to a MAF plus a MAB requires that we build two or three ships a year. To rebuild our mine warfare capability we need to build approximately five mine countermeasures ships each year. About seven mobile logistics support ships are needed per year. This total is about 60 ships greater than the 80 ship total included in the five year shipbuilding plan submitted with the budget in January.

ELEMENTS FOR NEW CONSTRUCTION

Senator Stevens: Has the Navy determined that all of the necessary elements for new ship construction will be available to support this significant increase?

Admiral Fowler: The exact mix of ships and their construction schedules to achieve the Administration's goal for the Navy force level have not been determined. Our planning will take into account availability of facilities and rational workloading of our shipyards. . With these factors considered, the necessary elements should be available.

INDUSTRIAL HOLD-UP OF NEW CONSTRUCTION

(Senator) Stevens: Do you anticipate that there will be any industrial hold-up on initiating construction of the new ships requested?

Admiral Fowler: The start of construction of the new ships requested in the FY 82 budget should follow contract award in a normal manner, with no unusual hold-ups.

CURRENT CONSTRUCTION AND CLAIMS

(Senator) Stevens: What is the situation in the Navy with the current ships under construction relative to claims against the Government by the various shipyards?

Admiral Rowden: At the present time there are no major claims against shpbuilding contracts. There are, however, several subvendor claims for minor amounts. These total approximately $15 to $20 million.

EXPERIENCE WITH DELAYS

(Senator) Stevens: In view of the delays in the submarine program, what is the Navy's experience in delays and problems in other shipbuilding programs?

Admiral Fowler: The problems and delays associated with the submarine program are not indicative of the total shipbuilding program due to the unique nature of submarine construction and its limited industrial base. Some of the other shipbuilding programs have experienced problems and delays to a lesser degree. In our current program, we have had delivery date changes caused by strikes, material shortages, contract award litigation, weather and additional work.

Control of Engineering Changes

(Senator) Stevens: What has the Navy done to get control of the engineering changes to ships under construction?

Admiral Fowler: Efforts to reduce the number of engineering changes to ships during construction are being concentrated in two areas. Both have emphasis on improving the quality of specifications before they are issued: (1) A five year program was started in 1979 to update and correct design data sheets, military and federal specifications, standard and type drawings, military and federal standards, military handbooks, and data item descriptions contained in shipbuilding contracts; (2) shipbuilder participation in the review of ship detail specifications before they are issued as part of a shipbuilding contract.

Estimated Cost Growth in FY 1981 and 1982

(Senator) Stevens: What is the Navy's estimated cost growth line for all ships under construction in FY 1981 and FY 1982? Please break out the cost growth by its various elements.

Admiral Rowden· The Navy has not requested any cost growth in FY 1981. The cost growth line for FY 1982 is $88 million. The break out is as follows:

AMOUNT	SHIP PROGRAM	PURPOSE
$26 M	FY 74 SSN	Additional Government liability under PL85-804 on 1973/1974 submarines built by Electric Boat
$22 M	FY 80 CVN	Upgrade of the Navy Tactical Data System (NTDS)
$40 M	FY 80 SSN	Alteration required to provide for backfit of the Vertical Launch System (VLS)
$88 M	TOTAL	

(Senator) Stevens ·How does the Navy's cost growth experience for FY 1980 and FY 1981 compare to prior years?

Admiral Rowden The following table, which lists the cost growth lines for the last seven years as currently structured in the FY 1982 ammended budget, compares the Navy's cost growth experience for FY 1980 and 1981 with prior years.

(in millions)

FISCAL YEAR	COST GROWTH
1981	0
1980	193.6
1979	395.1
1978	189.7
1977	321.7
1976	1,008.2
1975	976.8

Senator **Rudman** [presiding]. Thank you, Mr. Chairman.

We, as you can well imagine, have a rather substantial hearing load over the next few months so we are all going to have to become experts in many things in a very brief period of time.

I want to just follow on with you, Admiral, if I could, the discussion that I had with the Secretary of the Navy which the press seemed to enjoy. I wasn't really trying to sensationalize that issue as much as I was trying to get to the heart of what really has to be a principal problem on your mind. That is the industrial capacity in this country, in terms of output in the number of ships, the quality of those ships and how consistent the cost estimates are, which is really what our chairman has been talking to you about this morning and it seems that this is what we have been talking about a great deal to many of the admirals and generals who appear before us representing the three services.

With that in mind and looking at your proposed program, I would be interested in just what the industrial capacity is. Let's start off with surface vessels. What is the industry capacity as you assess it in terms of what you want to do (*a*) at the present time and (*b*) what discussions you have had with your major contractors, in terms of what they could do to change that capacity and what they would need in terms of commitments to do that?

I wonder if you could address that on the record because I think that is a principal problem which of course is how we got to the whole question of Secretary Weinberger's floating the idea of possibly building some of our combat ships overseas. I will tell you, that was a float without much lift. [Laughter.]

And, you know, I think that is probably not even worth talking about now. So why don't you just address that for me for the record if you could, Admiral.

Admiral **Rowden**. I will start in and then I will let Admiral Fowler, who has the prime responsibility in that area, address it.

We have public yards and private yards, as you are well aware. We build ships primarily in the private yards but we overhaul ships in both the public and the private yards. So when we take a look at the building capacity, we also have to take a look at the repair and modernization capability.

It is necessary in both of these things to keep a reasonably level load. People want to be employed and they want to be employed on a continuing basis. If it roller coasters up and down, we must be able to fill in the hollows from the peaks.

Admiral Fowler has done a considerable amount of work in looking at that, not just for surface ships, but also at submarines and aircraft carriers and how we can continue the repair and modernization that we need for the fleet that is in being, while reactivating ships and building ships and converting ships. He must make all of these plans come together, so that the 33 ships which you see in the column for this year can be expeditiously built.

Now, I would like to turn it over to Admiral Fowler because he can make definitive statements with regard to your question.

ANALYSIS OF SHIP CONSTRUCTION/REPAIR FACILITIES

Senator **Rudman**. Admiral, if you would like to talk about this program from the point of view of surface vessels other than carriers, carriers and submarines all in an integrated fashion, that is fine. I was just asking it compartmentally, but if you would rather answer it systematically then go ahead and do it.

Admiral **Fowler**. Senator, I will start with the broader picture and then go through each individual section. At that time, I will answer any questions you may have on each of the segments. I have looked long and hard at the Navy's fiscal year 1982 shipbuilding program. I can find no single factor in this program which would lead me to conclude that it cannot be executed.

We presently have 193 master ship repair contracts with firms in this country, all of which do ship repair business and some of which also do new construction work. These yards employ on the order of 170,000 workers. In addition, we have eight naval shipyards that employ about 70,000 workers, all of whom are involved solely in repairs.

The 193,000 firms with which we have master ship repair contracts have a wide range of capabilities. There are in this country only about 25 firms that we call major yards. There are only about 10 firms doing major ship new construction, only five doing major combatant new construction work and only two doing submarine new construction work.

Electric Boat, one of the major submarine construction yards in this country, carries out only new construction on submarines.

Newport News Shipbuilding & Dry Dock Co. does overhaul and new construction of submarines and does new construction of aircraft carriers. It has done nuclear cruisers in the past and major surface combatants. It is a large company.

Given our present shipbuilding facilities, even if we elect to pursue a program of ship construction involving very large ships, such as the battleships and the SL-7 conversions, there will still be adequate facilities and adequate capacity to do the program.

One factor that is a problem is that the number of shipyard workers has decreased. About 15,000 workers will leave the industry this year, and that fall-off will continue through the end of 1982. The funds appropriated in the 1982 shipbuilding program, a larger shipbuilding program than we previously had, will not show an impact in increased employment until about the end of 1982 or the early part of 1983. So we are going to be experiencing an increase in our building program at a time when we are facing a decrease in the number of people available to carry out the program. That is a problem.

We are looking at various management techniques which would allow us to make the greatest use of existing facilities. For example, we are looking at commercial work which the shipyards might perform. Such work would allow us to maintain capacity periods when Navy building is slow. Second, shifting overhauls around to various yards could help us achieve much the same goal. We are already communicating with many of the shipyards so that we can coordinate our construction plans with their projected schedules of capital investment. We are seeking to maximize efficient usage of all our resources.

In looking at the second tier suppliers and related areas I can find no problem. In looking at the number of engineers that we need for design work and related areas, I can find no problem. So there is sufficient capacity and there are enough people in design. The shipyard workers are going to drop off, unfortunately, and this is a problem, although we are trying to figure out ways to ameliorate the effects. The bottom line is that we can execute the 1982 program.

Senator RUDMAN. Do some of these yards, public and private, have the physical space, the launching ways, heavy equipment and so forth that is needed to handle additional vessels within their capacities should it be necessary to compress some of this program, if in fact the work force could be assembled, or are they all pretty much up to capacity?

Admiral FOWLER. Most yards, with additional manpower, could handle more work than they do presently.

INDUSTRY/GOVERNMENT COORDINATION

Senator RUDMAN. Although the private sector has to take the initiative in terms of assembling labor, if sometime in the next 18 months it becomes apparent that some of our construction programs are going to be compressed to a point where we need a longer time line than we would be comfortable with and the problem is not one of capacity but is essentially a problem of work force, then we may have to look at the mobility of our work force throughout this country in terms of some of the high skills that do exist and people who are sadly drawing unemployment around this country and industries in which the bloom has come off the rose, so to speak.

This is something that has been done in Europe very successfully. Certainly it is done in Japan which is a much smaller country in terms of the mobility of work forces from what I am told. It is possible that the American automobile industry may not return to the past levels of prosperity and employment for some time. That is a possibility. There are many highly skilled people who are really in serious trouble. We have welfare problems in those States and unemployment compensation is running out.

It seems to me that we ought to be a little creative in terms of talking to the people who sell to the Government and in terms of the kind of people who are there. You need only read a Midwest newspaper or watch a Midwest evening television program to hear tales of woe, of young people with homes, children, mortgages and payments who essentially are at the end of their rope.

If in fact we have needs for welders and skilled workers of various kinds, it seems to me that we should look at the mobility of the work force in this country if we are going to have to have a program. I have a suspicion, as I have looked at some of the past performance of some of the yards and looked last week at some of the data which the Navy has supplied me with in terms of what you are looking for, that we well may run into what you would call a choke point in terms of your procurement.

It seems to me that you should not be back before this committee a year from now saying well, you gave us all the money but unfortunately for all these problems we are all backed up and we are going to be behind schedule. I don't think we can afford that for the very reasons you spoke of. We just have too much time lag already.

I would hope that someone in the Navy industrial relations sector would take some time to look at what we are really talking about as a peacetime mobilization of productive forces, which I think is very important.

I think we have to rely on the private sector to a large degree, but it seems to me that the private sector needs some help from the armed services. This is not only true in naval procurement but it is particularly difficult in naval procurement because of the size of the things that we are buying as opposed to most of the things that we are buying for the other armed services. So I wanted to mention that.

Admiral **Fowler**. I agree with you most wholeheartedly, Senator, and I have taken steps in that direction. I think we need to give the industry a sense of where we are headed so that they can start to do their planning. I think industry should tell us what needs to be done to them so that possibly we can help them. But a good bit of this assembling the right work force in the right place is going to have to be taken on by the private sector.

Senator **Rudman**. I think it is very important. I think it is absolutely essential. I hope it is something that you will pay some attention to.

Admiral **Fowler**. We are. We are looking at that very hard and we have taken some steps already.

Senator **Rudman**. I have a few things for a number of people who I guess we will be here tomorrow that I am particularly interested in.

I do have a couple of questions for Admiral McDonald.

Admiral **McDonald**. I will be here tomorrow, too, Senator.

SHIPBUILDING PROBLEMS AT ELECTRIC BOAT

Senator **Rudman**. You will be here tomorrow also. Well, let's try one today. No, as a matter of fact, I think I will wait until tomorrow because it has more to do with aircraft, which we can talk about tomorrow.

I guess I would ask you a question, Admiral Rowden and maybe Admiral Fowler. I am very interested in this whole problem of Electric Boat which comes down to essentially what the chairman of our subcommittee was speaking of before he left and what we are very concerned about, and that is a general lack of performance, or at least an alleged lack of performance, in terms of quality, time, and money. I mean, you name it, if you believe the press reports and some of the committee things that I have seen.

The allegations were made that many of those problems were a result of chronic design problems caused by the Navy, specification changes. I am sure this has been the subject of many hearings long before I came here.

Since I have the rare opportunity of having you all in front of me this morning, I would like for you to tell me whether or not you think those allegations have any basis whether it is all their fault or if it is all your fault, or whether some place in the middle is probably where the truth is.

Whoever would like to address that.

Admiral **Fowler**. I will take that, Senator.

Senator **Rudman**. You are a brave man. [Laughter.]

Admiral **Fowler**. Well, it happens to be my responsibility whether I like it or not.

In my prepared statement I gave you a chart that shows the number of changes that we have had in a number of different types of contracts.

Senator **Rudman**. What page would that be on?

Admiral **Fowler**. Page 19, Senator. Changes in the design of a ship, particularly a new class of ship, are inherent in the shipbuilding process. It is something that takes place in the construction of all ships, commercial or naval.

TRIDENT PROGRAM

Senator **Rudman**. In the Trident program we had about 25,000 revisions out of a total of 10,600 drawings, which is an average of about 2.4 revisions or changes per drawing. The table shows that, compared to revisions made on other ships, both submarines and some commercial work, the Trident's 2.4 revisions per drawing falls well within the norm. As a matter of fact, it is almost half of what you would normally expect to find.

Of course, what this chart doesn't tell us is the complexity of the changes.

Admiral **Fowler**. That is right.

Senator **Rudman**. It does not address that issue obviously. It only addresses pure numbers of changes. Obviously if one of the drawings showed the tower located on the bottom of the hull instead of the top, that would cause some serious problems. So we really don't know how serious they were. Were these very serious major changes in the program or were they what you would call general kinds of changes?

Admiral **Fowler**. No, sir. One of the most significant changes that we had to deal with in the last few months was a change in the trim and drain system where we needed some valves to properly vent the high points in the tanks. Testing revealed that it was not done properly. So we had to go back and put in six valves to properly vent this system. While that was disruptive, it was not what you would call a major type of change. Most of the changes are in that category.

COST INCREASES AT ELECTRIC BOAT

Senator **Rudman**. You know, this whole issue with Electric Boat is really a microcosm of the problem of escalating costs we have across the armed services. You have looked at this and you are responsible for it. If you had to assess a number of factors pertaining to what has happened there and why we have had the runaway costs, the delays and so forth, how would you levy it?

Admiral **Fowler**. The first thing I would do is I would say that we do not have runaway costs. Particularly in the Trident program we have a type of contract that was structured for a lead ship with a target cost and a target to ceiling spread that was a little wider than the normal one because it was the first ship of design and a new class ship. As a matter of fact, they are a little bit above target but they have not gone to ceiling and neither the Navy nor the company believes that they will go over the ceiling. So I wouldn't in any way call that runaway cost.

Now, there is an inflation factor that is indexed and of course as the time on delivery of the ship slides out then the inflation costs go up.

QUALITY CONTROL AT ELECTRIC BOAT

Senator **Rudman**. What would you say has been the major problem with EB in terms of this program? Is it quality?

Admiral **Fowler**. One of the major problems has been in the area of quality. The quality control system broke down to a certain extent. When we recognized that that had happened, we took corrective action and the quality control system is now back on the road toward full recovery. I now have no doubts whatsoever about the quality of submarines coming out of Electric Boat.

I rode the last ship that went on its sea trials, the U.S.S. *Jacksonville,* on January 25 and 26 myself, and I had absolutely no reason to doubt that it would not perform very well. It did, in fact, perform in a superb manner. That ship has subsequently completed two additional sea trials and was delivered to the Navy on March 31, just last week. The final quality of the submarine is good. So the quality program at EB is back to full restoration. We found the problem and we, along with the company, took care of it.

Senator **Rudman**. That really should be the company's responsibility, however, not the Navy's responsibility. Am I correct?

Admiral **Fowler**. Well, under our present system of quality control we do not engage in any more inspection than is absolutely necessary. We have a system in which that the company operates their own quality control and we oversee it, although in some things, like pressure hull work, we do some actual inspection. We feel that such areas are too important to not have a checker and double checker and so forth. But normally that is the company's responsibility.

PERFORMANCE OF PORTSMOUTH SHIPYARD

Senator **Rudman**. There has been a great deal written about the new submarine construction program and there has frankly been more heat than light generated. I am interested because of the intense interest in my home State, in Portsmouth, N.H., in that particular project.

I for one have said that it is a mixed blessing. Could you describe how that yard is doing at this time in terms of its primary mission which, of course, is the repair and overhaul function?

Admiral **Fowler**. It is doing very well.

Senator **Rudman**. Have they been on time and within cost?

Admiral **Fowler**. Pretty much so, yes, sir. They are not always on time and they are not always within cost, but they have a good performance record.

Senator **Rudman**. I toured that yard with then Captain and now Admiral Young about 2 months ago. They gave me a briefing which essentially indicated that from their point of view, compared to the other yards in that business, the Navy yards, public yards and some private yards, I believe, their performance seemed to be pretty much on target and they rated well among those that did repair and overhaul. Is that an accurate statement?

Admiral **Fowler**. Well, I have eight naval shipyards in my command and whenever I go to one of them they each one tell me they are the best. [Laughter.]

Senator **Rudman**. That is why I asked the question.

Admiral **Fowler**. Portsmouth stacks up quite well, yes, sir. I will be there on Saturday to take a look at them.

SUBMARINE CONSTRUCTION IN PUBLIC YARDS

Senator **Rudman**. What is the likelihood of new construction being done at Mare Island vis-a-vis Portsmouth?

Admiral **Fowler**. Well, I really can't answer that. We have taken a hard look in my command at the need for a third yard and whether it should be a public or a private yard. We are still looking at a number of factors at the situation at EB and at Newport News.

I have made some recommendations and they are still under review and I don't know what the final outcome of that will be.

Senator **Rudman**. Obviously when one yard receives the new construction, be it Mare Island, Portsmouth or another yard, additional retrofit, overhaul and repair activity would have to be transferred to the yard that does not receive that work. Is that an accurate statement?

Admiral **Fowler**. Yes. If we put one of the yards that presently does overhaul work into the new construction business, this would probably offset some of the overhaul work presently done in this yard and that work would then have to be taken on by other yards that do overhaul work.

Senator **Rudman**. So really the bottom line is that those public and private yards that are involved in the submarine construction are probably going to be very busy in the near term.

Admiral **Fowler**. Yes, sir. No question about that.

Senator **Rudman**. I do not think that we automatically should say that the new construction should go to a particular yard without looking at everything. It could be a mixed blessing for a community. The procurement program seems to be on a very high peak right now, but obviously if people geared up for that kind of expansion and then something happened in the procurement process along the way you would have the very kinds of gyrations that Admiral Rowden was talking about. I have tried to warn them up there that that is something that you have to be careful about.

When will that decision finally be made as to where that award will go?

Admiral **Fowler**. To open a third yard?

Senator **Rudman**. Yes.

Admiral **Fowler**. I don't know. I think that will be a difficult decision to make because of all the factors involved.

SOVIET ALPHA CLASS SUBMARINE

Senator **Rudman**. Admiral Rowden, last week when Admiral Hayward was here before us he spoke of the Soviet Union's new

Titanium class Alpha Submarine and he said it set new standards for speed, diving performance and so forth and said that it really indicated a very substantial increase in demonstrated Soviet prowess in technological advancement in shipbuilding construction which was a rather surprising development.

My understanding is it travels at 40-plus knots and could probably outdive most of our antisubmarine torpedoes, at least those that we know about at this point.

I wonder if we have, No. 1, taken any measures to redress this particular imbalance. If it is classified we can talk about it another time. And, second, how advanced are our own capabilities in titanium metallurgy? What are we doing in this area?

Admiral **Rowden**. Some of it is classified but I think we can talk around it. We have taken action with regard to weapons.

The principal way to defeat that submarine, the Alpha or the Oscar, is to have a weapon that will do the job. You are quite correct that speed is a problem and the depth that these submarines can dive to is a problem.

We have modified the MK-48 torpedo, which is the principal weapon of our SSN force, to accommodate to the increased speed and to the diving depth of those particular submarines. Our other principal weapon is the MK-46 torpedo. which is carried by P-3 aircraft, S-3 aircraft, helicopters, LAMPS or the H-3, and is also employed by ships in both over the side and Asroc launchers. We recently modified that torpedo to handle what you might call the pre-Alpha, and that is the Mod. 5 to that program. That weapon is behind the 48 torpedo in capability.

It may not be possible to build all of the capability that we need into that torpedo. We have torpedo under development called the Advanced Lightweight Torpedo, it is the MK-XX torpedo at the present time, and it addresses those problems. But I can assure you that the weapon is the most serious part of the link in our ability to be able to identify, classify, and engage the submarine.

Senator **Rudman**. I understand that.

Admiral **Rowden**. This is one that is getting a pretty full-scale addressal. Now, I don't mean in any way to minimize the work that we are doing in acoustics, active and passive, or in other areas that deal with the question of where the submarine is and who the submarine is.

With regard to titanium, I am going to again defer to Admiral Fowler.

U.S. TITANIUM CAPABILITIES

Admiral **Fowler**. Well, we have some effort going on with titanium. I think what I would prefer to do would be to cover that in a classified supplement for the record, if I may, Senator.

Senator **Rudman**. That will be fine.

[The information follows:]

U.S. Titanium Capabilities

As to the advancement of our own capabilities in titanium metallurgy, titanium metallurgy in the U.S. industry is primarily aimed at meeting the needs of the aerospace/airframe and chemical/petrochemical industries. The industry has concentrated on producing thin gage flat product sheet into complex shapes, and forging, with minimal requirements for welded thick section alloy titanium that would be required for NAVSEA. The most significant recent advances in titanium metallurgy in the U.S. are in near net shape processing to reduce fabrication costs. This includes casting, powder metallurgy, hot isostatic, pressing isothermal forging, super plastic forming, and diffusion bonding.

Alpha-type alloys such as Ti-100 can be welded with adequate shielding in an inert atmosphere, either in a chamber or with local trailing shields attached to the welding torch. Titanium welding in the U.S. is not done extensively and the industrial state of the art is limited mostly to about 1 inch thick widths with the exception of in-chamber electron beam welding which has been performed on widths over 2 inches thick. A large number of alloys have been developed; however, only a few are used in production. The Ti-6Al-4V alloy and unalloyed titanium grades comprise about two-thirds of the U.S. mill products production.

[Deleted.]

The Navy is, [deleted] working in this area and already has a suitable alloy [deleted]. To date the Navy has built the ALVIN submersible in the late 1960's and is currently building the Sea CLIFF Submersible. The Navy's material technology program includes basic research, as well as advanced development efforts. The Navy has initiated a welding fabrication technology transfer program with industry. The Navy has also initiated a cost-reduction R&D program aimed at developing a lower cost alloy and more cost effective joining technology.

SUBMITTED QUESTIONS

Senator **Rudman**. Gentlemen, I will let you off easy. [Laughter.]

We have additional questions from Senator Stennis which we will submit for your response.

Thank you very much.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

QUESTIONS SUBMITTED BY SENATOR STENNIS

Senator Stennis. The Navy recently completed charter arrangements involving two Japanese-built, German Flag roll-on/roll-off (RO/RO) vessels. It is my understanding that these cargo ships do not conform with Military Sealift Command regulations that require hull subdivision that assures flooding of any one compartment will not lead to capsizing or sinking of the vessel. Why was this charter entered into when a number of American-built ships are available that meet the so-called "one compartment" standard?

VADM Rowden: The purpose of this competitive procurement was to time charter U. S. Flag roll-on/roll-off (RO/RO) ships that were critically needed by the Department of Defense to augment, and in some cases replace, the aging RO/ROs now operated by the Military Sealift Command (MSC). The request for proposals (RFP) did not include requests for any ships not under U. S. Flag, but did not preclude U. S. shipowners who might have foreign built vessels from responding. Since the need was near term, the requirement could not be met by an American, shipbuilding program. The U. S. built tonnage offered was not suitable or was not immediately available.

A U. S. Flag operator, Lykes Bros. Steamship Company, Inc. offered foreign built RO/ROs which were subsequently chartered by MSC. These vessels are currently undergoing modifications in an American shipyard at Baltimore to meet specifications for U. S. Flag ships. It has been alleged that these ships will not meet safety require- ments. COMSC Instruction 3541.5B contains safety standards for government owned or bareboot chartered, civil service manned vessels. The ship design features and related safety standards for the Lykes RO/ROs come under the cognizance of the U. S. Coast Guard and the American Bureau of Shipping. Lykes will operate these RO/ROs to meet these standards.

During operation of these ships, they will be manned by U. S. merchant seaman whose seagoing maritime labor unions have supported the acquisitions. In addition, future repair and maintenance work will be performed in U. S. shipyards. They are providing valuable additions to the U. S. Merchant Marine and will enhance our military sealift posture.

BATTLESHIPS

Senator Stennis: Admiral Rowden, it is my understanding that the Navy is now advocating the reactivation of all four IOWA-class battleships rather than the NEW JERSEY and the IOWA which are in the budget request.

Is the Navy convinced that this is a viable option in view of your severe personnel retention problems?

Admiral Rowden: As a result of recent compensation improvements and in expectation of further progress toward truly competitive wage scales, we are projecting an upward trend in retention. It is absolutely essential that this trend continue. With such momentum, the Navy can get enough new recruits and retain the necessary number of petty officers to man NEW JERSEY and IOWA.

Senator Stennis.

What about the plan to put naval aviation aboard the battleships? Is the AV-8B Advanced Harrier the only potential candidate for this mission?

Admiral Rowden: Initially, the Navy intends to provide austere facilities for operating two to four helicopters. Based on the experience gained with this installation, future employment of larger numbers of aircraft and expanded aviation facilities will be explored to include both helicopters and VTOL/VSTOL aircraft.

Senator Stennis.

What is the cost per battleship to strengthen the deck in order to accommodate naval aircraft?

Admiral Rowden: For the aviation concept discussed in the previous question, the flight deck currently installed in NEW JERSEY will suffice. Detailed costs for a similar installation in IOWA are not yet available. For follow-on aviation facilities, cost and feasibility studies will be made once the concept of operations and aircraft are defined.

Senator Stennis.

At one point, the Nato Sea Sparrow was to be placed on board the NEW JERSEY. I understand this is no longer the case. Why is this?

Admiral Rowden: An early concept for reactivating the battleships included NATO SEASPARROW. It was determined subsequently that the system could not withstand the over-pressure effects when firing the main battery.

Senator Stennis.

The armament on the battleships includes the Tomahawk Sea Launched Cruise Missile and Harpoon Anti-ship Missile to provide for standoff capability against fixed land targets and ships. With this type of weapon range, what advantage does the 16-inch gun provide?

Admiral Rowden: The 16-inch guns continue to provide ranges, accuracy, and destructive characteristics, not available in the Fleet today, which are both highly desirable and an essential ingredient in the successful execution of amphibious operations.

Senator Stennis: Would you explain the interface of the AEGIS cruiser program with the DDGX cruiser/destroyer program in terms of mission and capability?

Admiral Rowden: While CG 47 is a cruiser and DDGX is a destroyer, each is a Battle Force capable multi-mission warship. DDGX will be less expensive, with reduced command and control, anti-air and anti-submarine warfare capabilities. It will have significant anti-surface and strike capabilities. DDGX's will serve as swing ships to participate with CG 47's in Battle Group anti-air actions and DD 963's in anti-submarine operations. DDGX will also support underway replenishment and amphibious groups, a role not assigned to CG 47.

The precise configuration of DDGX is yet to be determined. Its characteristics are being selected to compliment the capabilities of CG 47 and other Battle Force ships.

Senator Stennis: The DD 963 class ships are undergoing a significant armor plating enhancement program. Is a similar program being considered for the CG 47 class ships?

Admiral Rowden: CG 47 is a forward fit conversion of DD 963. As such, it uses some of the growth margin built into that class. The dominating factors in design were to maintain maximum commonality with DD 963, while incorporating the AEGIS Weapon System and passive survivability enhancements.

Ship survivability is not simply a function of armor plating. Instead it is a careful balancing of active and passive protection measures. DD 963 is an ASW ship with little active protection against air attacks making additional passive protection desirable. To this end, armor plating topside and in the magazine areas are now being backfitted. CG 47 ships, on the other hand, have a great deal of active protection afforded by the AEGIS Combat System. Nevertheless, CG 47's passive protection compliment is significant: increased aluminum thickness in selected superstructure areas, HY-80 steel around the magazine, shock and EMP resistance, and extensive fire protection systems. This combination makes CG 47 the most survivable cruiser built by the U.S. Navy in more than 30 years.

Methods for further enhancing CG 47 survivability continue to be examined within the context of increased effectiveness and ship impact.

Senator Stennis: The GAO has recommended elimination of the SPS-49 radar from the CG 47 ships. Would you explain the advantages of this system?

Admiral Rowden: Tactical advantages offered to CG 47 with SPS-49 aboard include:

A. Greater deceptive capabilities.
B. More flexible resistance to electronic countermeasures.
C. Auxilliary support for Battle Group offensive air operations.
D. Potential power savings while the ship is in transit.

SCN Appropriation Extension

Senator Stennis The funds for Navy Shipbuilding and Conversion are now available for a period of five years. The Navy has proposed that this period be extended to seven years. Would you comment on why the additional time for obligation of funds is required?

Admiral Fowler: The most important factor which has driven the need to extend the Shipbuilding and Conversion, Navy (SCN) appropriation availability is the length of construction time. Today, the average time required to complete ship construction is approximately six and one half years. After ship delivery, there is a Post Shakedown Availability (PSA) period of an additional 11 months to conduct trials and correct deficiencies. Therefore, on the average, ships are delivered to the fleet approximately seven and one half years after authorization.

Funds are obligated through construction and PSA period. At the end of the current five year funding availability, the funds expire and may no longer be used for new obligations. Expired funding will continue to be available for changes which are within the scope of existing contracts. However, the entry into a new contract or modification of an existing contract for "new scope" work requires new obligational authority funding. Work which is "new scope" in nature, continues to be required even after the appropriation expires. As a consequence, additional time is required to fully obligate funds for the purposes for which they were appropriated.

The FY 1977 SCN appropriation, which is scheduled to expire on 30 September 1981, provides an illustration of these points. Current delivery schedules indicate that some of the ships in the FY 1977 program will deliver between one month and up to three years beyond the five year appropriation availability. An estimated $600 to $625 million will remain unobligated when the appropriation expires, and of this amount, $169 million will still be required to fund "new scope" obligations. These obligations are required to complete the program authorized by the Congress, yet they are scheduled to occur in the latter stages of ship construction. However, these costs for new scope work cannot be legally incurred after the appropriation expires. Failure to attain an extended new obligational authority will dictate that the remaining work will not be done and ships will not be completed. It is strongly recommended that the Congress extend the availability of the FY 1977 SCN appropriation for new obligational authority for at least an additional two years.

Cost Growth Funds and Obligation Period Extension

Senator Stennis To what extent has the Navy used the cost growth funds to alleviate the need for extension of the obligation period?

Admiral Fowler: Shipbuilding programs in the early 1970's were heavily impacted due to the higher than budgeted inflation which occurred. Cost Growth funds provided in later years were used to finance the increased program costs resultant from this inflation. Since the Cost Growth funding was appropriated in later years, it was used to fund costs associated with the completion of shipbuilding programs and remained available for an additional five years.

For the more recent shipbuilding programs, cost growth funds are not available to accomodate the expected "new scope" obligations required to complete programs after the appropriations expire. For the FY 1977 shipbuilding program, above and beyond the cost growth funding available, an estimated $169 million of new work will still be required after the appropriation expires. Clearly, cost growth reserves are no longer adequate to assume the total cost of remaining "new scope" work after program year funds expire.

Examples of Causes of Ship Construction Delay

Senator Stennis What are examples of the causes which precipitate delays in ship construction and what portion of the delays is the fault of the contractor?

Admiral Fowler: In addition to the general complexity of modern naval vessels, there are many factors which contribute to ship construction delays beyond the contract delivery date. Some of the delays are contractor responsible. Limitations of the facility or workforce and late delivery of subcontractor furnished material and parts are elements which could precipitate delays in delivery. The government may negotiate changes or specification revisions to improve the overall capability of the ship or to correct an error in the design. Depending on the magnitude or scope of the change, the ship delivery dates could be affected. No generalization can be made on the portion of the delays which are caused by the contractor.

Navy Actions to offset Delivery Incentive and Penalty Clauses

Senator Stennis Is the Navy taking any action to offset these delays by use of the delivery incentive and penalty clauses in the ship construction contracts?

Admiral Fowler: Attempts by the Navy to improve the reliability of delivery schedules through incentives and penalty clauses have yielded limited results. Attainment of milestones is sometimes outside the control of the shipbuilder even when, technically, it is contractor responsible delay. In many cases, the shipbuilder is dependent upon the suppliers to maintain within rigid schedules to provide necessary materials for the accomplishment of the planned milestones. If the suppliers fail to provide the material in a timely manner, work will not be completed regardless of the incentives or penalties on the shipbuilder.

Time Required to Award a Contract

Senator Stennis It generally takes six months to a year of the five year obligation period for the award of a contract. Why is this such a long period? Is it possible to award the contract in a shorter period of time?

Admiral Fowler: The process of contracting for warships is time consuming, due to the cost and complexity of the ships, the requirements involved in all government contracting, and the necessity to prepare and review material which justifies the fact that the business arrangement is equitable to both the government and the contractor. Some of the justification material is prepared by the contractor to support his ability to perform the work and his costs required to accomplish it. Other justification material is prepared by the government, both in the audit of the contractor's data and in the formal contract reviews and approvals required by law.

Certain justification material is normally prepared prior to the start of the fiscal year, although amendment may be required due to Congressional action on the budget request. This material includes the Procurement Plan (which sets forth overall contractual and business strategy to be employed) and, in some cases, the Source Selection Panel (which specifies the evaluation criteria which will be used in determining the successful offeror).

Once the basic procurement strategy is approved, other justification materials, such as the Request for Authority to Negotiate and the Statement of Determinations and Findings, are prepared when required by law.

The contractor first becomes involved with the issuance of the Request for Proposal (RFP), which constitutes the formal solicitation of offers from prospective shipbuilders. The RFP contains the specifications for the ship and draft of the planned shipbuilding contract. Since the contractors response involves the expenditure of considerable funds and considerable effort, the RFP is not normally released until the appropriation act is passed and the kinds and quantities of ships are known. The shipbuilder then will require two to four months to prepare his proposal, depending on the complexity of the ship and on whether the ship was the first of a class or a follow-on procurement to a ship currently under contract.

When the proposal is received by the government, it must be reviewed in detail. The review will cover the contractors ability to perform, including his understanding of the technical requirements and the capability and capacity of his physical plant and workforce. The review will also cover his cost proposals, including audits where required. This review normally takes about two months. At this point, a Pre-Negotiation Business Clearance is prepared. This document is prepared for the purpose of establishing and obtaining the approval of higher authority on the government's negotiating position. Preparation and approval requires about one month.

With this approval, negotiations with the shipbuilder can begin. These negotiations may require one to three months or more, depending on the number of contractors, the disparity between the shipbuilder and the government positions, and the degree of technical discussion required. At the conclusion of negotiations, the Post-Negotiation Business Clearance is prepared, to document the results of the negotiations, including justification of significant changes from the government's pre-negotiation position. Preparation and approval, including obtaining the approval of the Secretary of the Navy, normally takes an additional month.

In summary, the process of contracting for ships is complex and time consuming. This is so because ships are complex and costly, because substantial justification of government actions in awarding a contract is required by law, and because substantial effort is expended to assure that a fair and equitable business arrangement is reached. Thus award of a shipbuilding contract nine-to-twelve months after the start of the fiscal year is reasonable.

Naval shipbuilding budget requests assume that appropriated funding will be available for the entire first year of the appropriation. In recent years the Department of Defense appropriation has not been passed until late in the first quarter of the first year of availability. Since proposals on shipbuilding contracts are developed at the contractor's expense, contractors may not feel this expense is justified until the Appropriation Act has been signed. Timeliness in the appropriation process would enable more timely award of contracts.

Extensions of Obligation Availability with the Seven Year Period

Senator Stennis There have been several extensions allowed to prior year SCN programs. If the seven year obligation period is allowed, can you give us assurances that future requests will not be made for extension of obligation availability?

Admiral Fowler: Seven years is the average time required from the beginning of the fiscal year of authorization through the correction of deficiencies during the Post Shakedown Availability (PSA). There are many ship programs, most notably the TRIDENT submarine and the CVN aircraft carrier programs, which have longer construction times and would not experience deliveries within a seven year appropriation availability. For the ship programs which could not be completed within a seven year availability, the Navy would continue to seek reprogrammings or extensions as in the past.

SURTASS

Senator Stennis: What is the status of the Surveillance Towed Array Sensor (SURTASS) Program?

Admiral Rowden: The SURTASS program is proceeding on schedule. With the DSARC III production milestone completed last year, a multiyear contract was awarded in September 1980 to build the first three T-AGOS ships. Negotiations for the mission electronics contract award are in the final stages. IOC for the first SURTASS system [Deleted]

Senator Stennis: Basically SURTASS/T-AGOS is a system configured for peacetime use. Has any consideration been given to the installation of SURTASS sensors on combatant ships for use in crisis and potential conflict situations?

Admiral Rowden: The SURTASS/T-AGOS system will be a valuable undersea surveillance sensor in periods of crisis and potential conflict as well as peacetime. Just as with other naval vessels that are unarmed or lightly armed, SURTASS will be employed in those areas where we exercise control of sea and air space. Due consideration has been given to installing SURTASS on combatants. This was found to be impracticable because of our already austere combatant force and because the mobile surveillance mission can be better performed by T-AGOS ships in the current operational concept.

Senator Stennis: What about comparing the cost effectiveness of using surveillance buoys as alternative to mobile surveillance units such as T-AGOS ships?

Admiral Rowden: A simple cost comparison is difficult because SURTASS and surveillance buoys (the Rapidly Deployable Surveillance System, RDSS) are not interchangeable, but complementary systems. [Deleted]

Actual cost-effectiveness is affected by the nature of the threat (that is, how quiet it is), geographic location, and the duration of the coverage.

LAMPS MK I

Senator Stennis: There is $232 million included in the fiscal year 1982 budget amendment for procurement of additional SH-2F helicopters for the LAMPS MK-1 ASW mission. These helicopters will complement the SH-2F helicopters that are currently in the active fleet. I am advised that more surface vessels are modified with LAMPS MK-I capability than there are helicopters for deployment on these vessels. How many ships at the present time have the LAMPS MK-1 capability but do not have SH-2F helicopters assigned?

Admiral Rowden: The following ships currently have the capability to operate LAMPS MK I:

Ship Class	Number
FF-1040	6
FF-1052	46
FFG-7	8
DD-963	31
CG-26	9
FFG-1	6
CCN	5
DD-993	1
TOTAL	112 (40 of this number are scheduled for LAMPS MK III update through 1991.)

Using a surge factor of 85%, the number of current LAMPS MK I capable ships that could be deployed is 95. The current Primary Aircraft Authorization (PAA) is 60 fleet SH-2Fs. This leaves a current helicopter shortfall of 35. However, over the next 10 years 40 of the total 112 LAMPS MK I capable ships will be backfitted to receive LAMPS MK III.

Senator Stennis: Please provide for the record a listing of those ships by category that do not have helicopters assigned but have the LAMPS MK-1 capability.

Admiral Rowden: The assignment of helicopter detachments to LAMPS MK I capable ships is driven by operational requirements, deployment schedules and fleet exercises and changes frequently. Accordingly, a snapshot listing of current LAMPS MK I platform assignments would not be meaningful.

SUBCOMMITTEE RECESS

Senator **Rudman**. The subcommittee will stand in recess until tomorrow, Thursday, April 9, at 8:30 when we will receive testimony from the Department of the Navy on the fiscal year 1982 aircraft and weapons procurement request.

[Whereupon, at 11:15 a.m., Wednesday, April 8, the subcommittee was recessed to reconvene at 8:30 a.m., Thursday, April 9.]

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1982

THURSDAY, APRIL 9, 1981

U.S. Senate,
Subcommittee of the Committee on Appropriations,
Washington, D.C.

The subcommittee met at 8:30 a.m. in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Warren Rudman, presiding.

Present: Senator Rudman.

DEPARTMENT OF DEFENSE

Department of the Navy

Aircraft and Weapons Procurement

STATEMENT OF VICE ADM. WESLEY L. McDONALD, USN, DEPUTY CHIEF OF NAVAL OPERATIONS (AIR WARFARE)

ACCOMPANIED BY:

- LT. GEN. WILLIAM J. WHITE, U.S. MARINE CORPS, DEPUTY CHIEF OF STAFF FOR AVIATION
- REAR ADM. D. P. ROANE, USN, DIRECTOR, SURFACE COMBAT SYSTEMS DIVISION
- REAR ADM. RICHARD A. MILLER, USN, DIRECTOR OF BUDGETS AND REPORTS
- VICE ADM. ERNEST R. SEYMOUR, USN, COMMANDER, NAVAL AIR SYSTEMS COMMAND
- REAR ADM. JOSEPH B. WILKINSON, USN, DEPUTY COMMMANDER FOR PLANS AND PROGRAMS, NAVAL AIR SYSTEMS COMMAND
- COMDR. JOHN W. STARK, USN, HEAD, BUDGET AND LEGISLATION SECTION OF AVIATION, PLANS AND REQUIREMENTS DIVISION

INTRODUCTION OF WITNESSES

Senator Rudman. The subcommittee will come to order.

I might say that our subcommittee chairman, Senator Stevens of Alaska, has some heavy leadership responsibilities for the next couple of days and asked me if I would come down and chair these hearings for him and, since I have been attending most of them, I am pleased to chair them here with you this morning.

We are here this morning to receive testimony on Department of the Navy aircraft and weapons procurement request for fiscal 1982.

We are pleased to have with us today Vice Adm. Wesley L. McDonald, Lt. Gen. William J. White of the Marine Corps, and Rear Adm. D. P. Roane.

BUDGET REQUEST

The amended fiscal year 1982 budget for Navy and Marine Corps aircraft procurement is $9.3 billion as compared to $6.2 billion for fiscal year 1981. The fiscal year 1982 budget request is for 283 aircraft which is an increase of 71 aircraft over fiscal 1981.

The amended fiscal year 1982 budget request for Navy weapons procurement is $3.2 billion which is a 19-percent increase over fiscal 1981.

It may be necessary to close the hearing today due to classification of materials to be covered. In that event, if the members of the subcommittee or witnesses will indicate their desire to close the hearing, I will set a time for going into closed session. Most likely this would be for a period when a majority of members will be present, which I am not sure will occur this morning due to this coming up on this recess. If this is the case, those individuals not cleared or not having the need to know will be required to leave.

Now, before going on to submitting your statements, I understand that there is a statement here this morning from you, Admiral Roane, which is a classified statement, classified as secret.

Admiral **Roane**. Yes, sir.

Senator **Rudman**. Would you think that to discuss that even generally we probably ought to close the hearing?

Admiral **Roane**. I can commence in the unclassified sense, sir. In responding to questions it might very well have to be in classified.

Senator **Rudman**. All right, why don't we plan to do it that way. I would prefer to keep the hearing open as much as possible.

Admiral **Roane**. Yes, sir.

Senator **Rudman**. You can submit your detailed statements and summarize your oral statements.

Admiral McDonald, will you be going first?

Admiral **McDonald**. Yes, sir, with your permission.

Senator **Rudman**. Will you proceed?

AVIATION PROCUREMENT REQUEST

Admiral **McDonald**. It is a pleasure to be here with you this morning, Mr. Chairman, and I am sure I speak in that sense for the other members of the Navy-Marine Corps team. We welcome the opportunity to be able to present to you our aviation procurement request for 1982.

As you have indicated in your opening remarks, I have prepared a statement. It has been submitted to the committee and I request that it be made a part of the record.

Senator **Rudman**. It will be.

Admiral **McDonald**. I will try to capsulate for you very briefly some of the essence of that statement orally within the 10-minute time frame. I would then hope that we could proceed to General White so that he might at that time present some remarks relative to those unique parts of naval aviation specifically directed toward Marine Corps aviation. Then I would like to go to Admiral Roane for his statements on WPN.

Senator **Rudman**. Fine.

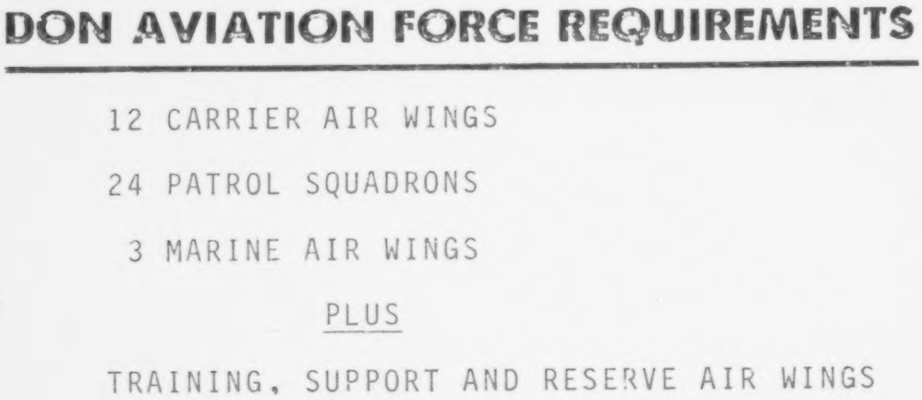
Admiral McDonald. I am not trying to structure the hearing at all, but it would appear that then the questions could come more freely to cover all aspects.

Senator Rudman. I think it is better that you structure it than I structure it, because if I structure it will probably be unstructured. [Laughter.]

NAVAL AVIATION FORCE STRUCTURE

Admiral McDonald. Thank you, sir.

As a starting point, I thought I would describe very briefly the composition of naval aviation so we know what the ground rules are and what we are trying to do.



DON AVIATION FORCE REQUIREMENTS

12 CARRIER AIR WINGS

24 PATROL SQUADRONS

3 MARINE AIR WINGS

PLUS

TRAINING, SUPPORT AND RESERVE AIR WINGS

Chart 1

CARRIER AIR WINGS

Admiral McDonald. The slide shows that we have 12 carrier air wings. These are the active duty forces—24 patrol squadrons, 3 Marine air wings, plus the normal complement of training, support and reserve air wings.

Training of course includes the training command squadron and their aircraft. The support aircraft are our own logistics aircraft. Regarding the reserve forces the Navy has two carrier reserve air wings, the Marine Corps has one reserve air wing and we have 13 reserve patrol squadrons.

DEPARTMENT OF THE NAVY
TACAIR

WINGS

12 USN AIR WINGS	3 USMC AIR WINGS
2 USNR AIR WINGS	1 USMCR AIR WING

SQUADRONS

24 USN VF	12 USMC VMFA 1/
24 USN VA	8 USMC VMA
12 USN VAM (TKR)	5 USMC VMA (AW)
9 USN VAQ	1 USMC VMAQ
4 USNR VF	2 USMCR VMFA
6 USNR VA	6 USMCR VMA 2/
2 USNR VAQ	RECCE VMFP
RECCE	

1/ DROPS TO 9 IN FY-84

2/ DROPS TO 5 IN FY-83 AS ONE SQD TRANSITIONS TO EA-6A.

CHART 2

WING COMPOSITION

Admiral McDONALD. This viewgraph displays what the wings basically are comprised of as far as squadron levels are concerned. Mr. Chairman, to acquaint you with what a carrier air wing looks like, we have 24 fighters, usually 24 light attack and 12 medium attack in each air wing. Some airplanes also are of the tanker variety.

The Marine Corps has 12 fighter squadrons, currently F-4's. The slide is slightly outdated in that it says the force drops to nine squadrons in 1984. That is no longer applicable. They will maintain their 12 fighter squadrons for the foreseeable future. The Marine Corps light attack squadrons include both A-4 squadrons and AV-8 squadrons; and they have five A-6 squadrons which are the medium attack force.

There is a great commonality between Marine Corps aircraft and Navy aircraft, as you are well aware. The Marines go to sea as part of our carrier air wings just like naval carrier squadrons do aboard carriers. The others are as we say, cats and dogs, the reconnaissance aircraft and of course the EA-6B VAQ aircraft. Then of course we have the four Naval Reserve fighter squadrons and six Reserve attack squadrons where the Marine Corps Reserve has two fighter squadrons and six light attack squadrons.

ATTRITION RATE OF AIRCRAFT

Senator **Rudman**. I am familiar with most of the aircraft you speak of this morning but I am not familiar with their age in terms of when these first came to the fleet and to the Corps. Could you give me an idea on some of these aircraft as to what their approximate age is?

Admiral **McDonald**. Yes, sir. I have another slide which lines up all the aircraft and if I could address it then, I think it would fall in very comfortably at that time.

Senator **Rudman**. Fine.

Admiral **McDonald**. Now having established the background of what naval aviation composition is, let's look at what our attrition rates are and what are the requirements relative to it.

COMMUNITY	ANNUAL ESTIMATED ATTRITION	ATTRITION PLUS RETIREMENTS PER YEAR
TACAIR		
• VF/VA	66	150
• ASW	2	8
• AEW	1	5
HELICOPTERS	23	75
PATROL	2	16
SUPPORT	3	16
TRAINING		
• JET	9	31
• PROP/HELO	4	14
LAMPS	4	9
TOTAL	114	324

Chart 3

ESTIMATED ANNUAL ATTRITION

Admiral **McDonald**. You will see here our annual estimated attrition. The figure, if you have not been watching fairly closely, looks rather staggering, like the 114 aircraft of a year that we lose due to crashes or some other sort of attrition. I can assure you that when people fly airplanes they attrite them in every way known to mankind.

Senator **Rudman**. Admiral, I have got about 5,000 hours in light aircraft and I am well aware of that fact. [Laughter.]

Admiral **McDonald**. That plus the retirements which take place—and this which goes back to your basic question regarding those older aircraft that are now beginning to fall out of the inventory—drives us to a total of 324 airplanes that we see that need to be replaced every year on an annual basis.

AIRCRAFT PROCUREMENT

	FY-81		FY-82	
	APPROP	SUPP	JAN	AMEND
A-6E	12	12	4	12
EA-6B	6	6	2	6
AV-8B	-	-	-	12
F-14	30	30	24	30
F/A-18	53	60	58	63
CH-53E	14	14	11	14
SH-60B	-	-	8	18
SH-2F	-	-	-	18
P-3C	12	12	6	12
E-2C	6	6	6	6
C2(VCX)	-	-	-	-
C-9B	2	2	-	-
T-34C	45	60	-	60
TH-57	7	32	-	30
EC-130Q	1	1	2	2
TOTAL	188	235	121	283
TOTAL APN	$6.11B	$6.25B	$6.96B	$9.35B

CHART 4

FISCAL YEARS 1981 AND 1982 AIRCRAFT PROCUREMENT

This is our required procurement baseline. We intend to try to replace those 324 or so to maintain the force level. As you mentioned in your opening remarks, there were 188 that were authorized and appropriated for fiscal year 1981. The supplemental adds to that and gives us a total of 235 aircraft.

The fiscal year 1982 as submitted in January before the amendments was 121 aircraft. There is a tremendous gap between the 324 and what was then being proposed. The amendments have brought that number up to a reasonable number as far as meeting the attrition and retirements—up to 283 aircraft.

As you mentioned, the increase in the APN budget request has gone from $6.1 billion up to $9.35 billion if you look at the appropriations in 1981 to the request in 1982. So I see a significant increase in dollars.

If you look more carefully at what was submitted in January, which was $6.96 billion as opposed to the $9.35 billion, you will see an increase of 134 percent in numbers of aircraft for a 34-percent increase in dollars to purchase that number.

Now, hidden in that number are 90 trainer airplanes. The large number of trainers that are in that number could allow you to say easily that we are inflating our members, and that is somewhat true. However, as you are aware, as we try to build to 15 carrier air wings there is going to be a need to increase pilot training. There has been a need to increase the number of trainers in the flight training program anyway up to this point in time. So that increase is really a step in a positive direction—to get well in the training command which is very needed.

TRAINING AIRCRAFT

Senator **Rudman**. Which aircraft is the training aircraft?

Admiral **McDonald**. The two training aircraft that are shown are the T-34 Charlie, which is a Beachcraft turboprop as you are probably aware, and——

Senator **Rudman**. It is like the civilian Bonanza with a turbo engine basically.

Admiral **McDonald**. It is the Mentor with the turboprop, exactly, sir. The TH-57, which is the Bell Jet Ranger, is the other airplane that we are referring to in that slide.

In that number there are 191 combat aircraft and 123 attack aircraft in the request.

In response to your earlier question regarding age, the A-6—not the "E" model but in the A-6 series airplane—has been in the inventory since the early 1960's. The "E" model is an updated version of the A-6A which obviously was the first that came in. The A-6E incorporates modern technology and weapon systems that make it a very effective all-weather aircraft, but we are looking at an airframe that is 20 years old.

The EA-6B is a much newer aircraft entering the fleet in the early 1970's. It is an expanded version of the A-6. It has four seats instead of two with the pilot and navigator. It is our electronic warfare aircraft and it has two ECMO's as we call them in each crew.

Senator **Rudman**. Who builds that?

Admiral **McDonald**. Grumman builds both of those aircraft, sir.

AV/8B AIRCRAFT

The AV-8B is an issue that I pass to General White to discuss in detail. This is the first year that the AV-8B is appearing in the hearings as a request for procurement. There has been long lead money put in each year by the Congress but there has been lack of support from the Navy from the standpoint of affordability only in trying to make it go.

Now that the opportunity is here to expand with some additional money, the AV-8B is going to come into the inventory. It is a much updated AV-8B Harrier. General White will discuss the characteristics of that airplane.

F-14 AIRCRAFT

The F-14 is an early 1970's fleet introduction aircraft. It really got into fleet use in the mid-1970's, although it is about a 10-year-old airplane, it remains the premier fighter in the free world today.

There are some F-14s that are still in the fleet in fighter squadrons. There are 16 F-14 squadrons now. We hope to grow to 18 squadrons by 1982 and our long-range plan has us continuing to replace F-4s with F-14s on all of our big-deck carriers. However, there are eight fighter squadrons right now equipped with F-4s and those airplanes are the late 1959-early 1960 introduction of airframes. Again, those airplanes have all been modernized, but we are talking to an airframe that is quite old.

AIRFRAME PERFORMANCE OF F-14

Senator RUDMAN. They have been modernized in terms of avionics and weapon systems but the performance of the airframe is the same?

Admiral McDONALD. Yes, sir, that is correct. There are some performance factors that are coming in, such as maneuvering slats and upgrading the engines slightly, but you are still within the old performance parameters. My prompters are saying smoke eliminators and a few things like that which enhance survivablility are also very important.

CH-53 AIRCRAFT

The CH-53 is a new aircraft in the investory. The Echo is an updated model of the A's and the D's which the Marine Corps has had for about 10 years I estimate.

SH-60B AIRCRAFT

The SH-60B is a new airplane.

Senator RUDMAN. What is the SH-60B?

Admiral McDONALD. The SH-60B is the airborne element of the LAMPS MK-III system, that is to say is the helicopter that is integral to the LAMPS MK-III, system. This is the first year of our request for procurement, so it is a brandnew airplane.

P-3C AIRCRAFT

P-3C's are the workhorse of our maritime patrol force. They have been in the inventory about 20 years, but have been continually upgraded from an A to a B to a C, and now to an update 3 model of the C. We feel that this airplane will comfortably last until the mid-1990's, and we may even decide to keep perpetuating the aircraft at that time. It is that effective for us.

E-2 CHARLIE AIRCRAFT

E-2 Charlies are our airborne early warning aircraft, the airplane with the big dome on it. It is new technology and it is replacing an airplane called the E-2B. The E-2C is relatively new. So we would like to continue buying those to give a force of four for all the air wings that we have. We are approaching that objective now.

C-2 AIRCRAFT

The C-2 is the COD issue. That series aircraft has been in the inventory a little over 10 years. Our position with the COD is to continue a C-2 and not go to a new COD because of both the affordability problems and the need for early introduction to meet fleet operational requirements. It just makes sense to continue C-2 as the middle element of a mix of airplanes that will provide logistics support.

C-9B AIRCRAFT

The C-9B is the DC-9, if you will, which we use for our logistics support organic to Navy. These aircraft provide a quick response for flying personnel, for example, from Jacksonville to Norfolk to embark on ships and that type of thing.

Senator RUDMAN. You only have two in 1981 and none for 1982. How many of those does the Navy have now?

Admiral McDONALD. There are a total of 15, of these, the Marine Corps has 2 There is a requirement for a larger number of those, however. That number is hard to nail down specifically but we are looking at a number above 30.

Other airplanes are there as well. We already have discussed the trainers. The EC-130 is a C-130 doing special electronic communications work. It is our TACAMO which stands for Take Charge and March Off.

TRAINING AIRCRAFT

Senator RUDMAN. I am just curious about the whole procurement outlook on the T-34C which is a Beachcraft Mentor——

Admiral McDONALD. With a turboprop.

Senator RUDMAN. It is a turboprop engine.

Admiral McDONALD. Yes, sir.

Senator RUDMAN. Do you happen to know offhand what your procurement cost is on those aircraft at this time?

Admiral McDONALD. No, sir, but I can get it for you.

Senator RUDMAN. I am just curious what that runs. Does that have a GE or a Garret engine? What does that have for a turboprop?

Admiral McDONALD. I think it is a Garret engine, but I will get that answer for you. Excuse me, it has a Pratt-Whitney engine and it costs $900,000.

Senator RUDMAN. When is the last time you bought those with normally aspirated engines—straight piston engines?

Admiral McDONALD. We would have to go back some years. This aircraft program started generating when I was the chief of Naval

Air Training in 1974. We were not buying Mentors at that time nor had we bought Mentors for, I would say, almost 5 or 6 years before that, if not longer. So I would say it was in the 1960's that we last bought the T-34B.

The T-34C came into the inventory in about 1977 or 1978. It is a contractor maintained aircraft and we are seeing reliability and maintainability in that airplane of over 90 percent.

Senator RUDMAN. That is your primary trainer now?

Admiral McDONALD. Yes, sir, that is the primary trainer in which all pilots going through naval flight training fly. After they have achieved about 62 hours of flight training, they then go into three branches, three subsystems or tracks as we call them. One track is the strike pipeline, which is the jet training. Another is the maritime pipeline, which is not in P-3's but that is where the students ultimately will go. The third track is in helicopters.

Senator RUDMAN. But of course these particular aircraft, these T-34C's with turboprops, run just under $1 million each and are fully equipped with avionics and the whole package.

Admiral McDONALD. Yes, sir. The tremendous tradeoff in the turboprop Pratt-Whitney engine is the fuel specifics that we are seeing. We are reaping tremendous benefits from those specifics over the Mentor and the North American T-28 Trojan which it is replacing and which, you may remember, was an in-between aircraft used for intermediate training.

Senator RUDMAN. That is a nice airplane.

Admiral McDONALD. Yes, sir. It is a good airplane to fly but expensive to fly.

Senator RUDMAN. Very.

AVERAGE AGE OF OPERATIONAL AIRCRAFT

Not on this list are the F-4, the A-4, and the A-7 not being procured. What is the average age of those aircraft at this time?

Admiral McDONALD. The A-4 was introduced into the fleet in the late 1950's. It has gone through lots of variations. General White has A-4 Mikes in the Marine Corps inventory. He has five squadrons of A-4 Mikes, which are the latest in the series where the thrust-to-weight ratio is almost 1 to 1 when the airplane is not loaded with bombs or tanks. It really is a very versatile airplane. It is upgraded in avionics and it is upgraded in weapons system delivery capabilities. But again, we are running to the end of an era with that airplane and it will be replaced.

Senator RUDMAN. What is the replacement aircraft?

Admiral McDONALD. The AV-8B.

Senator RUDMAN. And the F-4?

Admiral McDONALD. Their F-4's are like Navy F-4s, of course. It may be different models because all squadrons are not the same, but the F-4 series will be replaced by the F/A-18 in the fighter role.

Senator RUDMAN. And the A-7?

Admiral McDONALD. The A-7 will be replaced by the F/A-18 in the Navy in the light attack role.

Senator RUDMAN. Proceed.

Admiral McDONALD. I am not going to dwell on each of the systems individually, Mr. Chairman, because I think it would take too much time, so I will leave details for the question period. However, I would perceive there are some concerns on two specific programs that we have in the Navy, primarily the F/A-18 and the SH-60B or LAMPS MK-3 aircraft.

Senator RUDMAN. As a matter of fact, I have some rather specific questions on both of those procurement programs. If you would like to discuss those as we are going through the aircraft one by one that is fine.

Admiral McDONALD. We can do it whichever way you like, sir.

F/A-18

Senator RUDMAN. Since we are talking about the airplane now, why don't you tell us what those problems are. I have had my staff go over a list of past procurement of Navy and Marine Corps aircraft looking at the procurement track. Obviously that is a sore point and I would like to hear about any good efforts you are bringing out yourself. Why don't you tell me about it.

F/A-18 HORNET

MISSION

VF: ESCORT / MARITIME AIR SUPERIORTY **VA: STRIKE /CLOSE AIR SUPPORT**

CHART 5

FLIGHT TESTING OF F/A-18

Admiral McDONALD. All right, sir. As you are aware, the aircraft is currently undergoing flight test at Patuxent River. This is the first single site flight testing that we have ever tried. It has the contractor, Navy test, and Navy operational testing and evaluation people all working together and we are gaining tremendously in the interchange of information which is available.

In the flight test side of the house, the airplane has flown 3,600-plus hours. It is running slightly ahead on flight test schedule in hours and slightly behind on missions to be accomplished. That point is explainable from the standpoint that as we have explored the envelope, there are some things we need to get further into. We were not quite as definitive as we thought we should have been initially, and weather has created a loss of some aspects of certain flights that are flown. So we are having to fly some of those missions over.

The aircraft itself is about 4 to 6 months slower in the test program than we had anticipated. We have been holding our own for at least the last year and have been catching up slightly. That initial slow-down was primarily due to late delivery of the first articles and to some of the static test failures that we saw early on and for which we slowed the program down. We are not gearing it back up.

DESIGN CHANGES IN F/A-18

Senator **RUDMAN**. Was it necessary along this procurement track to make any major design changes in this aircraft either to the airframe or the engine because of its apparent inability to meet some of the missions assigned to it originally in the planning by either the Marine Corps or the Navy?

Admiral **McDONALD**. No major changes. There have been subtle changes which have taken place such as acceleration. Acceleration was one of the first problems we saw. The airplane was not meeting the specified acceleration of going from a 0.8 Mach number to 1.6 Mach number in 110 seconds. We were getting out to 1.6 in about [deleted], about the best that we had ever done. In fact, at the time we were doing the initial testing, it was running about [deleted] seconds.

So we started an examination of the airplane to see if we could reduce any of the drag that was on the airplane. Through some minor changes, such as things where a vent was sticking up and they faired it, and they did other minor adjustments to the airplane, we got it down to [deleted] seconds.

We feel that the acceleration is no longer a problem with the airplane. The airplane is not really a fighter in the 1.6 regime but, rather, it is intended to be transonic. It goes from 0.8 to 1.2 Mach numbers faster than anything in the U.S. Fleet and faster than the threat right now. That is to say that at about 1.4, the F-14 is going to come humming by, but it is going to take it out to at least about 0.8 to 1.4 for the F-14 to catch that airplane.

FA-18 COST INCREASES

Senator **RUDMAN**. Were there any particular problems that caused this rather rapid incremental cost increase or growth over estimates? Of course, we have had this with many systems. That subject is a preoccupation of the chairman of our committee and it is a preoccupation of mine. It has been talked about a great deal in many programs. We talked about submarines yesterday and we are talking about aircraft today. It is very high technology and we understand you are pushing the state of the art and your contractors are in someplace.

I guess what I really want to know, Admiral, is can you assess some of the cause for this and can you tell us what is being done to assure that maybe we are at the end of this overprojection kind of cost problem? If my figures are correct, the Navy and the Marine Corps are planning to procure about 1,377 of these over the term.

Admiral McDONALD. Yes, sir, and the number includes 11 test aircraft.

Senator RUDMAN. Yes, I understand that. I just want to know what we are doing about cost containment and whether we still have some problems ahead. This subcommittee has got some tough choices to make.

Admiral McDONALD. I understand.

Senator RUDMAN. They are very difficult choices.

Admiral McDONALD. We certainly share your concern because the Navy and the Marine Corps are absolutely solidly behind the F/A-18 as the airplane that we need now, or as soon as we can get it into the fleet, and which will carry us until the year 2000 or into that time frame. Without that airplane, tactical naval aviation is going to suffer in survivability aspects and force levels.

In responding to your cost question, you should know and probably have been briefed, that we had an $8.6 billion increase in the program between the SAR report in December 1979 to the SAR report in December 1980. Of that $8.6 billion, $7.6 was in inflation, both absorbed and other inflationary factors that enter into it. So 88 percent of that cost was inflation alone. That was a 12-percent increase that was due to cost growth in configuration changes, the minor areas that we are talking to, and to schedule changes, where we varied the number of aircraft we were going to buy, and Northrop's and McDonnell Douglas' overhead costs. Those kinds of factors entered in to create a $1 billion increase directly attributable to the program.

I would like to tell you that there will be no further cost growth in the airplane and I feel relatively comfortable in making that statement, but that has to be in the light of what inflation is going to be as far as predicted inflation and the inflation in the marketplace itself.

I think that we have the airplane at the stated development now that any cost growths that are associated specifically to the airplane will be fairly minimal from here out.

The other major costs that you will see, if you see them, will relate to how well we have estimated and how well we are able to operate on the OSD and marketplace indices for inflation.

ELIMINATING F-18 COST GROWTH FUNDS

Senator RUDMAN. I am sure you are well aware of the fact that the day before yesterday on the floor we voted for the supplemental. There was a deletion of $96 million from the fiscal year 1981 supplemental and the chairman of the Armed Services Committee, Senator Tower from Texas, stated during the markup that it reflected more of an aversion, if you will, to the growth in costs than it did any doubt about the capabilities of the aircraft to fulfill its mission.

What is this deletion going to do to your program? I would like to know that.

Admiral McDONALD. Well, the deletion of 7 aircraft in the supplemental would have put the program up to 60 aircraft. The $96 million effectively takes 7 airplanes out of that number and puts it down to 53. If the support remains for the program, which I hope it does because, as I said, it is an absolutely vital program for us in naval aviation, it means that we buy those airplanes at a later time. Any time you transfer today's scheduled profile of aircraft production to an outyear buy, you are increasing the cost of those aircraft by whatever the inflation factors are that you funnel into it.

The reason that we have such high inflation costs in this program is that it is an extended procurement cycle which terminates in about the 1990 time frame.

EFFECT OF INFLATION ON F-18 COSTS

Senator RUDMAN. Really, as I understand your procurement, there is a compounding of this inflation factor and the longer the term of your procurement track the more you have to build in on this.

Admiral McDONALD. As an example of that point, there is $907 million in this $8.6 billion that is inflation that has been generated purely from changing the buy in the early years to the number of aircraft in the outyears. In 1980 and 1981, John?

Captain WEAVER. Yes, sir.

Admiral McDONALD. In 1980 and 1981 we transferred 150 airplanes into the outyears.

Senator RUDMAN. Is that growth, the 88 percent that you assigned to inflation, compounded? Does that track pretty well with what the inflation rate has been in the country according to the figures of the Bureau of Labor Statistics or is it greater or less?

INFLATION IN AEROSPACE INDUSTRY

Admiral McDONALD. I think there is larger inflation in the aerospace industry than the normal inflation you see registered across the economy of the United States today. The OSD inflation indices are about 8 percent. Mr. Reagan is trying to drive that down to about 5 percent in the year 1986. That is the planning factor that we are looking at. We have to plan on that kind of inflation in the near term in procurement.

In the marketplace we are seeing between 16 and 18 percent inflation in the aerospace industry. To the people who are building components and assembling the aircraft today in general, and in the Hornet program in particular that is the case.

Senator RUDMAN. This is a very interesting subject and I think it is a very important one. I would like to get as much for the record in the next week or two from your financial people.

I guess the point I am driving at is I understand that. I guess what I don't understand is why the aerospace industry has had this particular inflation rate compared to the economy generally. You know, we talk about changing indexing in many of our programs and one of the reasons we talk about changing indexing is because many of the components within the inflation rate are not applicable to certain segments of the economy, for instance, as a component for housing. If you own a house and you have a mortgage at 7½ percent which you have had for 12 years, that inflation rate does not compound you individually.

Well, the fact is that obviously we have got a different situation in aerospace. We have got factors which we are not measuring in the general inflation rate which are obviously, you know, being compounded in the aerospace industry. You are talking about 88 percent of this growth being attributed to aerospace inflation.

So I guess what the committee would like, and I know that the chairman and I have talked about this as recently as yesterday, I would like to see from your financial people submitted for the record of this hearing, and we will keep the record open long enough for you to prepare it, essentially I would like to see the numbers and I would like to see the procurement clauses within the contracts with the contracts as to how these figures were arrived at and what their justification was for this inflation rate. That is not going to be easy, but I would like to see just exactly what they say. I am sure you must have done that, your procurement had to do that.

Admiral **McDonald**. Yes, sir. I don't mean to try to answer the question right here this morning, but we do have a visual display of that which has affected the F/A-18 in this past year, and which will give you a quick overview of the F/A-18. It does address all of the specifics of the aerospace industry and the inflation rates that might help clarify this particular part.

Senator **Rudman**. So you will all understand why we have this concern. I think the most graphic indication I can give you of our concern here without budgetary problems is the problem that we saw with the Army last week. I believe that the cost growth on a number of high technology programs within a relatively short time went from $27 million to $1.4 billion. If you would like to see that chart we have it, because it has got to be applicable to the armed services generally.

The problem we face is that we are now talking about substantial increases in military procurement which I think the great majority of members of this subcommittee are going to support. But our concern is that as you get into the outyears, we are looking at a defense budget, particularly with a continuation of procurement of these high technology programs, which is essentially greater than some of the projections for the total budget, not the military budget.

So we would like, if nothing else during the next 6 months, to get some handle on this and see whether or not there is some way to address this and make some hard choices. So I would like that information if I could have it. If you have computer information, I think we have got some people with the capability to understand that. I would really like to have that as a part of this record. That to me is the single, most important problem we are facing today and that is the growth caused by many factors within the defense budget that have nothing to do with the basic procurement, design changes or those conventional things which in the past have caused some problems.

Admiral McDonald. We will provide that for the record.

[The information follows:]

FORECASTING ESCALATION

OSD allowed escalation rates have consistently remained lower than the rates actually experienced in procurement of military aircraft. For example:

FY	Most recent OSD rates	Actual Exper. Escalation
76	8.0	8.68
77	6.0	8.29
78	6.8	8.76
79	8.7	11.28
80	9.7	12.78

In addition to this difficulty, OSD rates are kept low for out-year forecasts on the assumption that the economic situation will improve. This affects not only out-year budget estimates, but also current ones, as Aircraft Procurement, Navy funds for a specific fiscal year are expended over a five year period. Thus, in FY 1982 budget estimating, escalation through FY 1987 must be considered.

NAVAIR has made an independent estimate of escalation in the out-years, based on a study done by the Air Force, and forecasts for the economy and the aircraft industry done by an independent econometric forecasting firm. The results of this study, as compared to Carter and Reagan escalation estimates, and put into the perspective of program year increases, are as follows:

FY	Carter Budget	Reagan Budget	NAVAIR Estimate
82	7.7	6.8	10.6
83	6.9	5.9	10.1
84	6.3	5.4	10.0
85	6.2	5.1	9.9
86	6.2	5.0	9.7

If the less optimistic assumptions of the NAVAIR estimate prove to be correct, then the Carter and Reagan budget submissions could feasibly be underpriced, as shown in the following table:

	Possible Shortfalls in Carter Budget		Possible Shortfalls in Reagan Budget	
FY	% short	$ short	% short	$ short
82	7.0	485.7	9.2	858.5
83	10.3	852.0	13.5	1428.0
84	14.0	1269.2	to be determined	
85	18.0	1913.8	to be determined	
86	22.0	2347.8	to be determined	

F-18 Time Phased Comparison of Escalation

	12/79 SAR				12/80 SAR			
FY	Esc.	Cum.	Budget	FY75 $	Esc.	Cum.	Budget	FY75 $
75		1.0	20.0	20.0		1.0	20.0	20.0
76	8.0	1.08	109.8	101.7	8.68	1.0868	109.8	101.0
7T	1.5	1.0965	22.2	20.2	2.12	1.1098	22.2	20.0
77	6.0	1.1623	340.7	293.1	8.29	1.2018	340.7	283.5
78	6.8	1.2413	659.9	531.6	8.76	1.3071	659.2	504.3
79	8.7	1.3493	1038.4	769.6	11.28	1.4546	1036.1	712.3
80	8.6	1.4653	1434.0	978.6	12.78	1.6405	1436.3	875.5
81	9.0	1.5972	1752.5	1097.2	9.9	1.8029	2050.3	1137.2
82	8.5	1.7330	2512.0	1449.5	9.3	1.9705	2446.5	1241.6
83	7.8	1.8681	2939.1	1573.3	8.2	2.1321	2633.0	1234.9
84	7.0	1.9989	3075.6	1538.6	7.3	2.2878	2948.7	1288.9
85	6.1	2.1208	3483.0	1642.3	6.2	2.4296	3851.4	1585.2
86	6.1	2.2502	3652.5	1623.2	6.2	2.5802	5142.6	1993.1
87	6.1	2.3875	3269.9	1369.6	6.2	2.7402	5246.3	1914.6
88	6.1	2.5331	2987.2	1179.3	6.2	2.9101	5148.2	1769.1
89	6.1	2.6876	1832.1	681.7	6.2	3.0905	4798.9	1552.8
			29128.9	14869.5			37890.2	16234.0
Escal. incl.			14259.4				21656.2	
Increase in escalation 12/79 - 12/80					7,396.8			

The columns for the 12/79 SAR above show what escalation indices were used and allowed, the cumulative effect of the escalation, the dollar amounts actually budgeted for the life of the program, and what these amounts would equal in constant FY 1975 dollars. The columns for the 12/80 SAR show comparable information, with the notable exception that rather than reflecting official indices for prior year escalation, the rates shown for FYs 1975 through 1980 reflect actual escalation experienced by NAVAIR in aircraft procurement. The rates used for FYs 1981 through 1989 are the official OSD indices allowed for compilation of the 12/80 SAR and the FY 1982 Carter budget submission. All escalation rates shown are straight annual rates.

By subtracting the constant FY 1975 dollar amount from the total budgeted, the amount of escalation included in the total budget is ascertained. There was $14.3 billion included in the 12/79 estimate, and $21.7 billion in the 12/80 estimate, reflecting actual and officially projected escalation. The difference between these two amounts, $7.4 billion, is the total increase in escalation that has occurred and been recognized between the 12/79 SAR and the 12/80 SAR.

Consequently, of the total program budget increase from 12/79 to 12/80 of $8.8 billion, escalation accounted for 84%.

The amounts quoted in testimony were arrived at by using these same basic calculations, but with slightly different and more complex statistics. Thus there are slight discrepancies.

F/A-18 STRESS TESTING PROGRAM

Admiral McDonald. I can go on and give you more statistics on the F/A-18. The airplane, as I said, is in the flight test program. It is also undergoing static testing at St. Louis with an airframe out there being subjected to different stress loads. That program is at over 5,500 hours of a 6,000-hour plan first life cycle. It will then recycle for another 6,000 hours. We intend to test for two life cycles.

The loads that are being imposed on the stress article are of such severity that in a normal flight equation, that is to say, if you try to equate it to a flight envelope, the test article has been through over 8,000 equivalent flight hours. By that I mean we are putting more severe loads on it in the static testing than you would dynamically flying an airplane. So we really have about 8,000 hours of confidence in what is right or wrong with the airplane's airframe.

There have been several fatigue failures which you are probably aware of. They have all been addressed, and they have all been corrected. They will be in the production models of the airplanes. We have called in Blue Ribbon panels that have said that these are the proper fixes. So it is not just a contractor and the Navy trying to "Kludge it up". We feel very comfortable with the technical aspects of the airplane today.

Senator Rudman. What is the hour-life built into the design of this aircraft before it needs any major overhaul. I am not talking engine, I am talking airframe.

Admiral McDonald. 6,000 hours is what we are planning on.

Senator Rudman. What would the normal missions of these accumulate per year on an annual basis? Is there an average that you would assign, 400 hours a year?

Admiral McDonald. We plan our airplanes for someplace close to 15 to 20 years. It looks like this is going to be about a 15-year airplane based on that. As we have done in other aircraft, we would exercise the option as we are coming up to that 15-year point to do what we call SLEP, service life extend the airplane, or convert it in lieu of procurement by doing some things to modernize the airplane if another aircraft or another technology just has not superseded it by that time.

F/A-18 ROLL RATE

There are other problems that I am sure, you have been made aware of and possibly are aware of in your interest in the naval aviation. Roll rate is one of the things that has been discussed quite frequently in Aviation Week and Space Technology and in all the aeronautical journals.

The airplane was not rolling in certain specific points of the envelope at the rate that we had specified in the operational requirements in the 1974-75 time frame. We feel that that now has been fixed. We have done several things which have led to some periodicals rather glib conclusion that we have restructured the whole wing or replaced the wing. This is not true. We have made fixes such as extending the aileron, giving it more aileron throw, drooping the trailing edge flaps or programing the trailing flaps to add lift, reprograming through the software system the horizontal stabilizers so that they also act as lifting devices increasing roll and now we have programed the leading edge flaps three degrees up on one side and down on the other to complement the roll.

The only place that we were not meeting the roll rate was at the transsonic range of 0.95 to mach 1 below the 5,000-foot altitude regime. We now have every confidence that we are going to do that and I think that roll rate has been successfully addressed.

The airplane will be dynamically tested this month. It has already been tested with a fixed leading edge flap and the test was satisfactory from that standpoint.

I think we are into the grass on trying to refine that down to the knit right now. I think the roll rate is more than adequate in this airplane. And you will understand, Mr. Chairman, being an aviator, we are talking to an initial roll of 90 degrees in 1 second at mach 1 at 5,000 feet. There are not many aviators who are going to be expected to do that except in a specific maneuver to deliver low altitude weapons.

Senator RUDMAN. I would say so.

Admiral MCDONALD. Yes, sir.

F/A-18 RANGE

Range has been a subject of criticism of the airplane. In range the criticism was that we were not meeting fighter range which was specified as 400 nautical miles. We are demonstrating between 385 and 415 nautical miles projected on the fighter range. We feel that we will make the fighter range spec just about right on.

Senator RUDMAN. I don't understand how you would do your range here. That is what would be a normally expected full range of power settings and climbs and maneuvers and so forth?

Admiral MCDONALD. I will ask the program manager, Capt. John Weaver, as to what those specifications are to achieve the 400 nautical mile range for fighters.

Captain WEAVER. Yes, sir, in that consideration you are absolutely correct. We are considering combat maneuvering for a period of 3 minutes out at the end of the range of the aircraft. We are not getting any credit for the climb or the descent. We are then coming back to the carrier with sufficient fuel to come aboard at or after attempting to come aboard we decide for some reason that the deck was fouled, we could go to a tanker and refuel and come back to the deck or alternatively have fuel to go 100 nautical miles to a shore base. So it is a fully operational scenario.

Admiral MCDONALD. I would offer that it is roughly twice the range of the F-4 in that same situation and it is a replacement for the F-4 in the fighter mode. So we think there is a quantum improvement here and certainly the agility of the airplane is much more dramatic than the F-4.

STATUS OF F/A-8 DEVELOPMENT

Senator RUDMAN. When is your flight testing program due? I know it continues all the time, but when is it due?

Admiral MCDONALD. It should terminate in 1982, sir, with an Opeval which will be conducted of the attack side. We have just completed the initial operational testing and evaluation of the fighter side and still have the attack side to develop that aspect of the airplane. We will be commencing in the November to December time frame of this year, and continuing until April or May. That will pretty much terminate the testing of the airplane.

Senator RUDMAN. You will keep the committee informed if you run into any new problems along the procurement track at all, I am sure?

Admiral McDONALD. Yes, sir, to be sure, and on the technical side we won't have any problem there. There are enough people who have tried to shoot holes in the airplane that everybody is pretty well informed on that.

Senator RUDMAN. I would like to hear about it before we read about it.

Admiral McDONALD. Yes, sir. We will keep you informed, sir.

There are other aspects of the airplane I'd like to discuss. The number 4 fuel cell had some leaks that needed to be addressed early in the program. We feel that we have accomplished that. The tank was being molded in a rather crude manner, such as using a plaster of paris mold on the inside. So that you could get the plaster of paris out of it they took the big sledge hammers and beat it and then reached in and pulled the plaster of paris chunks out of it. Now they are putting in a soluable base that will dissolve with water and be flushed out. We have, I think, captured that particular aspect of the airplane.

Weight has been a problem. We have capped the weight at 36,000 pounds. It is a weight growth of about 1,500 pounds over what we had initially perceived, but we have a weight reduction program and we will do everything possible to contain the weight at 36,000 pounds.

It is going to cost us little bit of money to do this because as you start trying to add things you must consciously either remove something or redo that particular part to make it ligher without sacrificing the reliability and maintainability aspect.

Senator RUDMAN. That is what, full gross, 36,000 pounds?

Admiral McDONALD. Yes, sir.

Senator RUDMAN. In the fighter configuration.

Admiral McDONALD. Yes, sir.

Senator RUDMAN. I think we could probably move on. We have a lot to cover here.

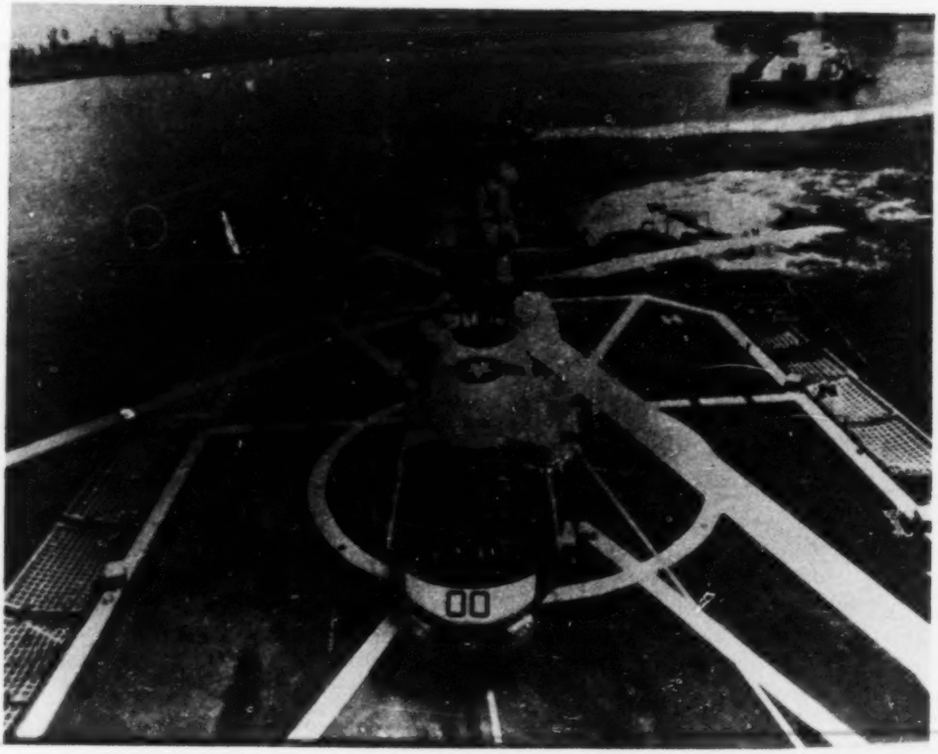


CHART 6

LAMPS MARK III

Admiral McDONALD. SH-60D is the LAMPS MK-III aircraft, planned for 204 aircraft in the program. There are five aircraft in test presently. There have been no technical problems with this airplane in test whatsoever. And I say that, knocking on wood, because that is kind of unusual for us at this stage of the test. It has over 1,300 hours in the test program right now. The integration between ship and aircraft is currently undergoing testing with the U.S.S. *Moinerney* off of the east coast.

We have demonstrated landings with the airplane and the recovery assistance securing and traversing system, which you may remember is kind of like a beartrap which hauls the airplane down onto the deck of a destroyer.

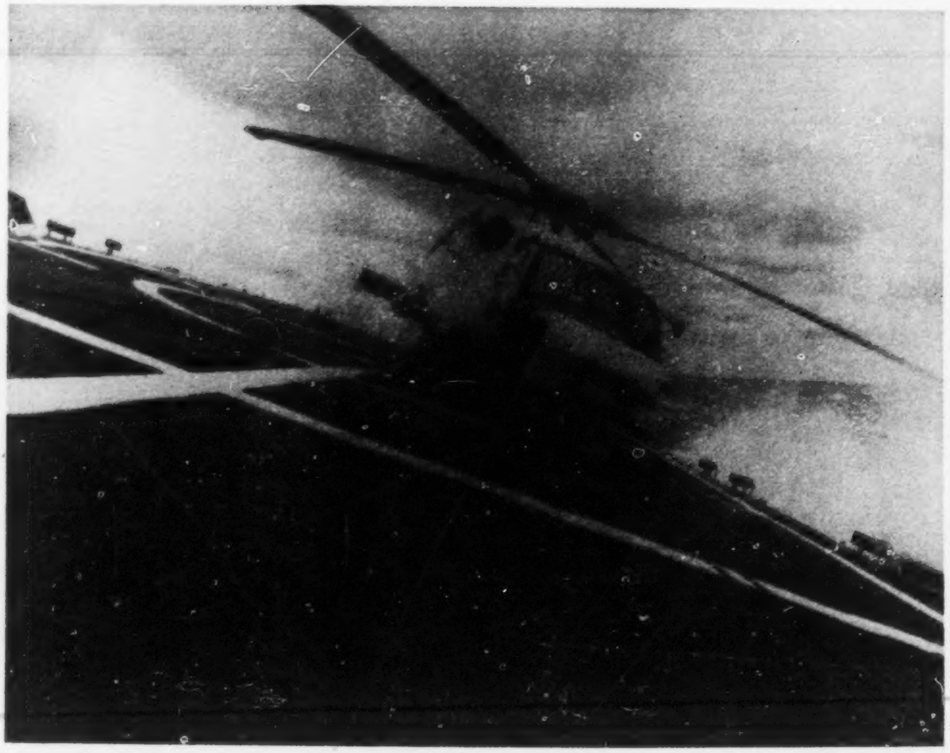


CHART 7

SEASTATE 5

This slide is an example of the aircraft Seastate 5 showing the angle at which we can trap him and hold him.

I would offer that in a LAMPS MK-I aircraft you have problems trying to keep the airplane on the deck. Of course, in the SH-60B they then will pull that airplane through mechanical means, hydraulics specifically, into the hangar to get it out of the weather. You could not push that airplane off of the flight deck. It is a 20,000-pound airplane as compared to the LAMPS MK-I which is a 12,000-pound airplane.

LAMPS MK III COST GROWTH

There is a cost increase of $1.1 billion in the SH-60B. We can discuss that at this time or later, as the case may be.

Senator **RUDMAN**. I was going to ask you about that and I just want to ask you one question. Is that under control at this point, those noninflation factors other than the design factors and the incremental cost factors that are not related to inflation?

Admiral **McDONALD**. This year we had to reexamine the LAMPS MK-III program and some of those factors were not completely under control. I think they are now. I would defer to Admiral Seymour, who is the commander of Naval Air Systems Command,

and who has been negotiating with the contractor and has made this a specific effort to get under control.

Senator RUDMAN. Admiral Seymour.

Admiral SEYMOUR. Mr. Chairman, they are under control for 1982. For 1983 and 1984 we have not totally repriced. We have made a repricing effort, but the major cost growth this year was a surprise to us in the APN account. What we are doing in this program is going from R. & D., where we did not have a cost growth and starting in production where the cost overrun that we see this year is due to the fact that we did not estimate properly what that production was going to cost, a half a billion dollars worth of not estimating it properly. I think we have APN under control and we will not have a problem with in production years. We will continue to have the inflation problem with those years.

INCOMPATIBILITY OF SH-60B WITH 1052-CLASS VESSELS

Senator RUDMAN. While I have got you there, Admiral, there was some information we received that the SH-60B might be incompatible with the 1052 class vessels. There were some profile problems. Can you comment on that in terms of its exposure and vulnerability? There has been some discussion about that. Are you familiar with that?

Admiral SEYMOUR. I am familiar with it. It is not designed to go on the 1052 class.

Senator RUDMAN. It is not?

Admiral SEYMOUR. No, sir. The LAMPS MK-I will continue to man the 1052 and the 1040 class frigates. The LAMPS MK-III is designed for the FFT class, FFT-7, the DD-963 and the CG-47 classes.

Senator RUDMAN. I guess it would be desirable if they were interchangeable, I suppose. Are there some basic problems?

Admiral SEYMOUR. The basic problem is size; also you have to have the weight on the ship in order to handle the shipboard electronics. I defer any further on that to Admiral Roane.

Admiral McDONALD. With your permission, sir, I will pass to General White at this time and we will come back and answer any questions. Those are the two programs I wanted to highlight in naval aviation for your concern.

Senator RUDMAN. I am glad you spent as much time as you did on the F/A-18 because it is important to get the facts and get them accurately and unemotionally stated. If we have a problem we have to know about it. If we are at the end of the problem then we ought to know about that. We are certainly going to be asked to appropriate a great deal of money for this program. By your own statement both you and the Marine Corps are putting a great deal of faith and hope in the long-term mission accomplishment in this aircraft and we surely don't need any problems in that aircraft, either design or cost.

PREPARED STATEMENT

Admiral, we will place your prepared statement in the record at this point.

[The statement follows:]

PREPARED STATEMENT OF VICE ADMIRAL WESLEY L. McDONALD, USN

DEPUTY CHIEF OF NAVAL OPERATIONS (AIR WARFARE)

Mr. Chairman and distinguished Members of the Committee:

I am honored to appear again before this body to present the fiscal year 1982 procurement request for naval aircraft. I am accompanied by Lieutenant General White, Marine Corps Deputy Chief of Staff for Aviation, and Vice Admiral Seymour, Commander Naval Air Systems Command.

It is my privilege today to describe briefly the character and composition of the Navy-Marine Corps aviation team, and the vital function of this budget request in maintaining the viability of that team.

In this budget request, we have fashioned a delicate balance among competing priorities. We have not proceeded with procurement as far in some areas as I would like, but I am satisfied that we have planned the distribution of this procurement in the most profitable manner for naval aviation.

There are several important thrusts inherent in this budget request. First among our priorities is the development and maintenance of increasingly higher levels of readiness. I hope I can articulately describe our three-level effort to achieve this goal.

Inherent in high levels of readiness must be the ability to conduct sustained operations, often in remote oceanic regions. Largely due to the impetus of the Congress in fiscal year 1981, we are enjoying the early initiation of a vital spares allowance enhancement program.

We are striving to maintain our minimum force structure through two media: the infusion of new procurement and, on a highly selective basis, extension of service life of existing systems.

And finally, but by no means the least of our efforts, we are dedicating considerable resources to force modernization. Again, two thrusts support this goal: new acquisitions and, through our broad program of aircraft modifications, modernization of our fleet systems.

But before discussing our plans for achieving each of these goals, I would like to describe briefly the character and composition of the Navy-Marine Corps aviation community these efforts will serve.

COMPOSITION OF NAVAL AVIATION

Naval aviation as we know it today is composed of twelve active and two reserve carrier air wings, three active and one reserve Marine aircraft wings, and twenty-four active and thirteen reserve antisubmarine warfare patrol squadrons. In addition to these fleet activities, and the squadrons comprising the Naval Air Training Command, we have seven helicopter squadrons and eight transport squadrons, four operating C-9B aircraft and four flying the old C-118 aircraft, and all manned by our reserve personnel.

The focus of our operations at sea is the carrier (CV) battle group, dramatically characterized by its mobility and its absolute integrity--its completeness. The enormous striking power of our F-14 and older F-4 fighters, and our A-6E and A-7 attack squadrons is well documented. Less well known are the other aerial systems that make the strike force effective. I prefer not to think of these other vital platforms only in terms of support, but rather as the essential elements of a greater whole. There is an obvious synergestic effort in the CV battle group--the effectiveness of the group is far greater than the sum of the individual units.

The E-2C Hawkeyes are the eyes of the battle group. The Hawkeye is able to control and guide the strike force and its aircraft--and it is also able to provide discrimination between friend and foe. In a fast-changing operational environment, this function is absolutely essential.

Airborne electronics countermeasure services are provided by the EA-6B Prowler, and the antiquated, but still effective workhorse of the fleet, the EA-3B.

The S-3A Viking provides the battle group with integral antisubmarine warfare and surveillance services. In the ASW environment, the Viking is augmented by our antisubmarine warfare helicopters, the SH-3--which also performs essential search and rescue missions. Any airman who has been in the water will testify that an "Angel" hovering overhead is a most reassuring sight. Most of us don't like to fly off our CVs without the Angel being airborne.

Also critical to carrier-based operations, and organic to the carrier air wing, are our aerial tankers, primarily KA-6s, which enhance and extend the reach of the strike force.

The sum is tremendous striking power, self protection, and the execution of vital support functions--all performed by aircraft that are organic to the carrier battle group.

Logistic support--parts, people and most essential to morale, mail--is provided by our Carrier Onboard Delivery (COD) aircraft. Contributing enormous tonnage to the sustained operations of the battle group are the medium and heavylift helicopters--CH-46s and H-53s. These helicopters perform yeoman services in the realm of logistics.

Farther from the CV battle group, but essential to its operations, are the land-based maritime patrol aircraft--the P-3 Orions.

And the list of essential missions and related aircraft goes on--LAMPS helicopters aboard our cruisers, frigates and destroyers; TACAMO strategic communications aircraft ever alert; and, although a comparatively small inventory, the C-9B aircraft flown by reserve pilots in the vital organic airlift role--all contributing to the operational effectiveness of today's Navy.

Marine Corps aviation is also very much a part of naval aviation. The mission of Marine Corps aviation is to provide the full spectrum of tactical air support for the fighting men on the ground. The Marine Air Ground Task Forces (MAGTF) are in may ways reflections of our carrier battle groups. They are highly capable, highly mobile, and able to conduct sustained expeditionary operations in remote areas.

Among the key support elements that enhance the striking power and greatly extend the reach of Marine ground forces are the assault support helicopters--specifically the AH-1 Cobras, CH-46 Sea Knights and the CH-53 Stallions. The flexibility, mobility and, in the case of the AH-1, the firepower, are combat-proven. The vertical assault mission works.

The near-term introduction of the F/A-18 Hornet and the CH-53E Super Stallion will greatly enhance the already exceptional capability of the highly mobile Marine aviation forces.

FORCE READINESS - TODAY AND TOMORROW

For the past two years the Navy has maintained a strategically significant presence in the Indian Ocean and, as each of you are most aware, the heart of that presence is our carrier battle groups. Although the cost has been high, and our resources have been stretched dangerously thin, there are no alternatives. I am extremely proud of our performance today. I find it difficult to imagine a more difficult operating environment--from virtually any point of view: logistically, operationally, meteorologically--or, on a more human level, from the viewpoint of the crew being able to spend only the absolute minimum amount of time ashore away from the tremendous daily operational demands each man faces during a deployment into that area.

We have learned a great deal from our experience about ourselves and our ability to conduct sustained operations in one of the most hostile and remote oceanic regions on earth. We have created, exercised and refined whole new philosophies for operations and support of operations.

Our initial arrival in the Indian Ocean was on a come-as-you-are basis. Since that time we have progressed through a make-do period to something of a business-as-usual footing. But please do not be misled--we still have some very serious problems. For now we are able to work around them, but we are going to have to redouble our efforts to further increase our mission capable, or readiness, posture--and we must preserve this enhanced readiness.

I want to emphasize what might be called a three-level effort to achieve ever-increasing levels of readiness in our combat and combat support systems. Within each of these levels of effort are discreet component efforts. For example, in the near term we are focusing considerable resources on today's systems. We have given a stout boost to our spares programs--and that boost was enhanced by the Congress in significant fiscal year 1981 additions.

We recognize clearly that we must sustain the momentum that with your help we have built. One quick infusion of spares dollars, however welcome, treats only the symptom--a long term commitment is required to cure the disease.

The most important elements in continuing such a commitment are a plan and backing by the necessary resources. Both are in place. We are enhancing our parts posture--our Aviation Consolidated Allowance List (AVACAL)--to sustain our deployed forces. At the same time, we are committed to a broad program of reliability and maintainability (R&M) modifications to our key systems. With your permission, I will describe some of these R&M programs later. These two initiatives--improved spares posture, and R&M modifications--will strengthen the readiness of today's systems. But I am concerned for the future.

The cornerstone of future readiness lies in high R&M as a specified front-end requirement. We are working very closely with industry to achieve levels of reliability and maintainability that are without precedent. Our efforts are bearing fruit--the F/A-18 Hornet is proving to be a remarkably reliable and maintainable system--especially when one considers the multi-mission capability and complexity of the Hornet. We believe that the Hornet will be the R&M criterion for the next decade.

In this budget, we have tried to develop a broad, comprehensive and systematic approach to improving the readiness of our fighting systems. We are working to accommodate today's problems by improving our spares situation. We are redressing deficiencies in our fielded systems by R&M modifications, and we are creating a new generation of more reliable, more readily maintainable combat systems. We are enhancing our ability to conduct sustained, meaningful operations at sea.

MAINTAINING MINIMUM FORCE LEVELS

Last year I stated that our current force structure was at an absolute minimum. Any further inventory reductions will reduce our ability to conduct significant operations at sea.

It goes without saying that we strive to acquire aircraft in adequate numbers to achieve and maintain our inventory objectives. For the past several years we have been constrained from doing so by limits to our spending authority. As I stated earlier, this is the first year in which we have been able to construct a procurement program that will closely approximate our annual aircraft requirements.

The problem of not being able to procure enough aircraft has been magnified somewhat by the high initial investment costs for the F/A-18 Hornet and the SH-60B Seahawk/LAMPS III.

We have had to initiate, on an interim basis, alternatives to new procurement. Clearly, the best short-term fix was to reduce somewhat the number of aircraft annually lost to the Navy's inventory. Attrition, unfortunately, is more or less fixed, so we attacked the other family of aircraft losses--retirements. We cannot stop our retirements altogether, but we can at least minimize the hurt by modernizing and extending, on a highly selective basis, our current systems.

We have a broad program of aircraft modifications to accommodate precisely these needs. I will describe the entire modification program in detail later, but in the meantime, I would like to explain how we have arrived at our requirement for the procurement of approximately 330 per year.

This exhibit displays, by community, the sorts of normal inventory reductions that we project each year.

COMMUNITY	ANNUAL ESTIMATED ATTRITION	ATTRITION PLUS RETIREMENTS PER YEAR
TACAIR		
• VF/VA	66	150
• ASW	2	8
• AEW	1	5
HELICOPTERS	23	75
PATROL	2	16
SUPPORT	3	16
TRAINING		
• JET	9	31
• PROP/HELO	4	14
LAMPS	4	9
TOTAL	114	324

I would like to emphasize that these numbers are approximate. They are updated periodically to reflect our most current historical data and future planning factors. For this reason, our projections of annualized replacement requirements may fluctuate--but only by very small numbers--each year.

At this time, we are reasonably satisfied with this fix-what-we-have approach, but we recognize clearly its shortcomings. Specifically, we are asset limited--we cannot SLEP or CILOP more airframes than are presently approaching the end of their service lives. The other major problem inherent in SLEP or CILOP is the resulting increase in the average age of a specific type aircraft.

We will see something of a reversal, or at least a slowing, of this overall aging trend as the A-4, A-7 and F-4 series are replaced by the multi-mission F/A-18.

PROGRAM BALANCE - A CONTINUING CONCERN

Last year, I described in some detail, the problem of creating a balanced procurement program with limited resources. That situation, fortunately, has changed. The budget as proposed by the previous administration accommodated the procurement of only 121 aircraft in fiscal year 1982, although our projection for this fiscal year had been for the production of 212 aircraft. President Reagan's amendments to the fiscal year 1982 budget reflect a procurement of 283 aircraft, or a 134% increase in aircraft for only 34% increase in APN dollars. It is the first time since 1972 that we have been in a position to almost reach the number of aircraft required to maintain the current force.

This matrix displays the quantities authorized last year for planned production in fiscal year 1982, and the quantities included in the present request.

AIRCRAFT	FY 1981 CONGRESSIONAL AUTH. FOR FY 1982	FY 1982 JANUARY REQUEST	FY 1982 AMENDED REQUEST
A-6E	12	4	12
EA-6B	6	2	6
AV-8B	12	0	12
F-14	30	24	30
F/A-18	108	58	63
CH-53E	0	11	14
SH-60B	18	8	18
SH-2F	18	0	18
P-3C	12	6	12
E-2C	6	6	6
T-34C	-	0	60
TH-57	-	0	30
EC-130Q	2	2	2
TOTAL	212	121	283

The supplemental and amended requests have our unqualified support. They are balanced, sensible and achievable--we will be able to execute the levels of production for which funds are requested.

The following table displays the types and quantities of aircraft requested and the funds needed for initial spares to support these numbers.

NAVY AIRCRAFT PROCUREMENT
FY 1982 AMENDMENT
($ in millions)

TYPE AIRCRAFT	QUANTITY	NET COST 1/	ADVANCE PROCUREMENT	INITIAL SPARES 2/
A-6E	12	269.9	7.3	17.7
EA-6B	6	229.5	16.8	25.4
AV-8B	12	575.2	49.0	32.8
F-14A	30	888.7	159.1	113.9
F/A-18	63	1890.1	236.4	343.3
CH-53E	14	250.3	22.8	17.5
SH-2F	18	212.6	20.0	5.4
SH-60B	18	585.6	155.3	30.7
P-3C	12	380.2	84.3	10.2
E-2C	6	226.3	20.5	18.5
UC-12B	0	.2	0	0 3/
C-2 COD	0	0	32.0	0
T-34C 4/	60	53.2	0	0 3/
TH-57 4/	30	15.8	0	0 3/
EC-130Q	2	74.9	0	2.0

1/ Includes Flyaway and support, minus prior year advance procurement.

2/ Included in APN-5, Aircraft Spares.

3/ Contractor supported aircraft.

4/ FY 1981 Supplemental funds also are requested to increase production of T-34C from 45 to 60, and TH-57 production from 7 to 32.

The Navy's program for aircraft modifications is broad, ambitious and well balanced. It provides one of the most expeditious and cost-effective vehicles for responding to the fleet's near term requirements. The modifications program is truly multi-faceted: it meets near term modernization needs, and, over the longer term, allows us selectively to maintain an aging force structure through Service Life Extension Programs (SLEP) and Conversion-in-Lieu-of-Procurement (CILOP). As I pointed out earlier, the SLEP and CILOP initiatives provide highly effective interim alternatives to new procurement.

Our budget request for aircraft spares and repair parts will support the procurement of initial, modification and replenishment spare parts. These spares provide cradle-to-grave parts support for our aircraft. The initial spares support the aircraft while it still is in production. However, this is not to say that these spares support the production line: rather, they increase the spares base to accommodate the addition of that year's production to the fleet inventory. Modification spares obviously support the aircraft modification program, and replenishment spares support the system after production and the initial support period.

At this time I would like to describe in greater detail the elements of the present budget request.

A-6 INTRUDER

The INTRUDER is the only medium attack carrier-based aircraft in the defense inventory equipped for day and night, inclement weather weapons delivery. This remarkable aircraft fulfills the war-at-sea, power projection and close air support roles admirably. The INTRUDER is capable of locating and striking both fixed and moving targets under all weather conditions. It is extremely well suited for the Navy and Marine Corps attack mission.

Although the INTRUDER has been in the inventory for nearly two decades, it has been constantly improved and modernized to maintain its position as one of today's most versatile and capable attack aircraft. All A-6E aircraft are currently being configured with Target Recognition Attack Multisensor (TRAM) equipments. This latest improvement integrates Forward Looking Infra-Red (FLIR), a combination laser designator/ranger, and a Forward Air Controller (FAC) laser energy receiver with the existing INTRUDER multi-mode radar, high speed computer and inertial navigation system. The combined system provides the flight crew with a radar display for longer range target acquisition and a shorter range TV-like FLIR picture of potential targets at night.

Weapons delivery accuracy is improved in the TRAM configured INTRUDER through the use of FLIR for precise aimpoint selection and laser ranging, and by self-contained target designation for use with laser guided bombs. In addition, the HARPOON missile system is being integrated into the INTRUDER now to provide a standoff capability to attack threats at sea outside of the threat AAW envelope. Other standoff systems are programmed to be incorporated into the A-6 to increase its survivability.

Congress added funds for the procurement of 12 TRAM configured INTRUDER aircraft in fiscal year 1981 and for long lead procurement for 12 additional aircraft.

The fiscal year 1982 request as amended includes $269.9 million for the production of twelve aircraft, and $7.3 million advance procurement for twelve aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $17.7 million is requested in fiscal year 1982.

EA-6B PROWLER

The EA-6B PROWLER operates in one of the most complex, demanding and rapidly changing environments in modern operations: electronic warfare (EW). The PROWLER is dedicated to airborne EW. That is to say that the aircraft and its crews have no additional missions. They work solely in the EW scenario: and they become highly skilled in its disciplines--I believe they are the best in the world.

The PROWLER is extremely flexible and fully capable of both active and passive EW support both at sea and over land. The quality of our EW support can be testified to by any Navy pilot who has flown in hostile areas with intense EW threats. Routine peacetime missions include passive electronic surveillance and active warfare training for friendly forces.

Because of the rapidly changing nature of electronic warfare, the PROWLERs avionics suite has progressed through three generations, and a fourth improved version is under development. To ensure compatibility, commonality and mission capability, all of the earliest EA-6B "Standard" version aircraft were modified to the latest production configuration--"Improved Capability," or ICAP. This modification effort was completed in March 1979.

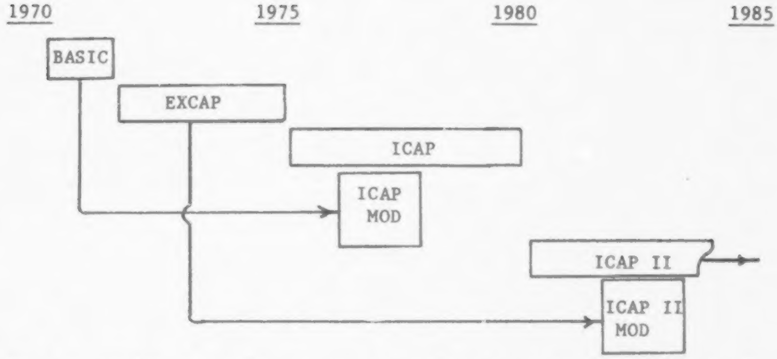
The ICAP system improved greatly the receiving, processing and operator display subsystems of the tactical jamming system. ICAP configured EA-6B production began in 1976, and the first ICAP squadron deployed in late 1977. Our fleets report that the ICAP aircraft substantially improved EW capabilities and readiness.

The next generation EA-6B avionics suite entered development in the Spring of 1978. This new version, ICAP II, will build on the present ICAP system and will capitalize on technological advances resulting from the U. S. Air Force's EF-111 development program.

The ICAP II program will be devoted primarily to the jammer portion of the system. ICAP II will provide the most effective tactical electronic warfare aircraft in the free world. The flexibility inherent in ICAP II will strengthen the Navy's ability to counter anticipated EW threats into the 1990s. All second generation PROWLERs--the "Expanded Capability" or EXCAP aircraft--will be converted to the ICAP II configuration. The IOC of ICAP II is fiscal year 1982. The following exhibit displays the evolution of the EA-6B System.

EA-6B WEAPON SYSTEM EVOLUTION

Calendar Year



The successful execution of aerial actions in today's electronic threat environment requires a capable, flexible platform able to detect, analyze and suppress hostile detection and targeting systems. The successful suppression of opposing systems will provide an acceptable degree of survivability for both airborne strike forces and ships at sea. The EA-6B PROWLER provides this essential service.

The present EA-6B force level does not meet the stated DON minimum force level required to combat the increasing proliferation of complex, sophisticated air defense threat weapons systems. In all wartime scenarios, including war-at-sea strikes, anti-air warfare (AAW), power projection ashore and ASMD, the level of combined enemy threats to DON strike groups argue persuasively for a full complement of EW aircraft.

Additionally, in view of the limited current force levels, any Navy augmentation of USMC operations would be severely limited; therefore, USMC EA-6B requirements must be supported in their entirety and cannot be predicated on Navy support.

In Battle Group defense against anti-ship missiles, the EA-6B can jam the certain radars, reduce the effectiveness of enemy air-to-surface missiles, and significantly enhance the effectiveness of Battle Group Defensive Electronic Countermeasures systems. The EA-6B is the dedicated DON tactical EW aircraft and is considered an integral and vital component of present and future Battle Group operations.

The fiscal year 1982 request as amended includes $229.5 million for the production of six aircraft, and $16.8 million advance procurement for six aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $25.4 million is requested in fiscal year 1982.

AV-8B

The AV-8B fulfills the U. S. Marine Corps requirement for an advanced V/STOL attack aircraft for future force projection capability. This remarkable aircraft will provide responsive close air support for the ground commander by combining the speed and firepower of a modern jet attack aircraft with unique basing flexibility.

The AV-8B combines the vectored thrust concept of the AV-8A with modern U. S. technology, such as a new wing with a supercritical airfoil and positive circulation flaps to achieve high lift in short takeoff. Also contributing to performance are Simple Lift Improvement Devices (LIDS) to increase vertical lift in ground effect, and a larger inlet to provide increased engine thrust. The major structural elements of the wing and forward fuselage are of strong, lightweight, advanced composite materials. A raised and somewhat enlarged cockpit is incorporated into a larger forward fuselage to improve pilot vision and provide additional space for a modern avionics system. The cockpit includes advanced avionics that provide greater weapon delivery accuracy, enhanced survivability, and reduced pilot workload. Reliability and maintainability improvements complement these changes.

The AV-8B has twice the payload/radius capability of the AV-8A. Seven weapons stations, four of which may also be used as fuel tank stations, and two fuselage-mounted 25mm guns are provided. The AV-8B carries conventional and smart bombs and standoff missiles, and can accurately deliver a weapon load of over 9,000 pounds. The performance of the AV-8B has been completely validated by flight demonstrations with two YAV-8B prototype aircraft. In addition, over 6,200 hours of aerodynamic wind tunnel testing have been completed.

The fiscal year 1981 Research, Development, Test and Evaluation funding supports the manufacturing of four AV-8B full scale development aircraft. The first AV-8B flight will be in October 1981.

Initial flight testing will consist of McDonnell Douglas development tests, with Navy Preliminary Evaluation (NPE) starting approximately 75 days after first flight and periodically during the test program. Board of Inspection and Survey (BIS) trials and follow-on Navy Technical and Operational Evaluations (OPEVAL) complete the test data base. Full scale development testing is directed toward initiation of BIS trials in mid 1983, with an Initial Operational Capability (IOC) in June 1985.

The fiscal year 1982 request as amended includes $575.2 million for the production of twelve aircraft, and $49.0 million advance procurement for twenty-four aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $32.8 million is requested in fiscal year 1982.

F-14A TOMCAT

The F-14A TOMCAT is a superb aircraft. Additionally, it is the platform for a versatile, uniquely capable and extremely lethal fighting system. The TOMCAT and its integral PHOENIX missiles are the only system in the Free World capable of successfully engaging the Soviet BACKFIRE bomber.

The long range standoff capability of the PHOENIX is complemented by both SPARROW and SIDEWINDER missiles for midrange to close-in combat. And if that is not enough, the TOMCAT also packs a high rate of fire 20mm cannon. This array of weaponry is what gives the TOMCAT such great versatility and depth as a fighter and as an interceptor.

One of the pivot points in any aerial fighting system is its ability to locate, identify and track potential targets. The AWG-9 radar meets and exceeds our needs and expectations in this regard. It is worth pointing out that even in the event of a failure of the AWG-9, the TOMCAT remains capable of successfully engaging its adversaries. The heat-seeking SIDEWINDER and the cannon, although enhanced by the AWG-9, are quite able to operate without any radar.

Fourteen F-14 squadrons have been deployed aboard our carriers, and two more squadrons are completing transition to the TOMCAT. The performance of the aircraft in operational situations has been highly satisfactory.

We are working diligently to redress the highly publicized readiness problems experienced in the past. Each succeeding block of production aircraft embodies significantly increased reliability, dependability and maintainability.

I would like to take a moment to discuss the three essential categories of problems affecting the TOMCATs material readiness; specifically, they are engines, support and age.

The Pratt and Whitney TF-30P-412 engine problem developed early in 1975. Catastrophic failures of the engine resulted in the loss of several aircraft. We initiated an ambitious improvement program in fiscal year 1979. The final phase of the program, component replacement (-414A), will begin in 1982. The result will be a substantial improvement in survivability.

Our support posture over the past three years has been less than optimum largely because of funding limits. We have addressed some of the problems through the reprogramming of funds into support lines. Unfortunately, and largely because of the well-documented protracted production lead times, we will not see significant improvements in material readiness for the next few years. With respect to age, although we still consider the TOMCAT a new system, our initial production block aircraft are nearly ten years old. We have updated these aircraft twice, each time resulting in improved readiness. The 66 percent mission capable rate we now experience in deployed older aircraft is a significant improvement over earlier years. However, by way of contrast, our newer aircraft average 78 percent. We are not satisfied yet, but the trend certainly is in the right direction.

PHOENIX--VITAL PARTNER TO THE TOMCAT

The PHOENIX missile stands alone as the finest long range air-to-air missile in the world. PHOENIX can be carried only by the F-14. The success of the PHOENIX continues to be extremely impressive. We have achieved an impressive success rate in PHOENIX firings from Navy TOMCATs. I emphasize Navy successes here because it reflects the fleet capabilities today: exercising the entire system from shipboard magazine storage to aircraft systems to the readiness of the aircrew launching the missile against an airborne target.

The TOMCAT/PHOENIX also have proven capability against fighters maneuvering at maximum capability at short range; extremely low altitude targets, including a simulated cruise missile; extremely high altitude aircraft; simulated air-to-surface missiles; and targets employing or being screened by electronics countermeasures.

The PHOENIX missile is undergoing an improvement program to increase its capabilities. Five major changes are being made to the AIM-54A to produce the AIM-54C. Analog circuitry is being replaced by digital systems to allow software programming for further growth. Stream raid discrimination, improved beam attack and improved rear quarter opening rate capabilities are being incorporated. Electronic Counter-Counter Measures (ECCM), longer range, very high altitude, and greater maneuvering target capabilities have also been added. Target detection and fuzing capabilities have been improved to provide small target, very low altitude, and chaff-to-main-target discrimination. Looking ahead, preliminary planning is already underway to develop a PHOENIX-X missile capable of much higher speeds and ranges for the threat of the 1990s.

TOMCAT SYSTEMS IMPROVEMENTS

The TOMCAT continues to mature with evolutionary changes and improvements. Major projected long range changes include a radar improvement, avionics upgrade, and the engine improvement program. Relatively minor changes currently ongoing are designed to improve combat readiness and safety of flight in the near term. The modifications are proceeding at a slower rate than we would desire because of spending constraints, but we are proceeding with those we consider to be absolutely essential. We are continuing to work with the U. S. Air Force on a limited F-101X engine and common core development program. Presently, this program is a back-up to the TF-30 improvement program, but it does suggest an alternative.

The Congress supplemented the Navy's fiscal year 1981 budget request and added funds for the procurement of a total of 30 TOMCATs. We very much appreciate this support--and welcome the additional procurement funds for this vital key in our airborne fleet defense.

The fiscal year 1982 request as amended included $888.7 million for the production of 30 aircraft, and $159.1 million advance procurement for 24 aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $113.9 million is requested in fiscal year 1982.

F/A-18 HORNET

The F/A-18 was designed as a truly multi-role aircraft. It is programmed to replace the Navy's aging inventory of A-7 Corsairs in the attack force, and Navy and Marine Corps F-4 PHANTOMS in our fighter forces. The HORNET embodies state-of-the-art reliability and maintainability (R&M) features that promise unprecedentedly high mission capability.

A reliability demonstration, completed by the contractor in November of 1980, demonstrated the superior potential of the HORNET during a 50-flight 100-hour test period. The aircraft achieved 8.5 mean flight hours between failure (MFHBF) during this demonstration; and even more significantly, the last 200 hours of testing at Patuxent River has yielded a reliability of 3.64 MFHBF. These figures are considerably better than the current fleet average of about one MFHBF for our tactical aircraft. The specification value is 3.7 MFHBF for the F/A-18, and I am confident that this goal will be reached and exceeded. Perhaps even more significant than the R&M features is the flexibility inherent in the HORNET. By design, the HORNET can be reconfigured to perform either fighter escort or strike interdiction missions with a minimum of time and personnel effort. The first F/A-18 Training Squadron was commissioned at NAS Lemoore, California, in November 1980. This squadron now has its first aircraft. An operational Evaluation (OPEVAL) of the HORNET will commence in October 1981. The first Fleet Squadron, a Marine F-4N Squadron, will transition to the F/A-18 starting in July 1982 and return to MCAS El Toro in early 1983. Navy squadron transition will commence shortly thereafter.

Though the HORNET development program is, in general, proceeding satisfactorily, two accidents, resulting in the loss of an aircraft in England and one at Patuxent River, have had an impact on the program. The first accident on September 8 resulted from the catastrophic failure of the low pressure turbine disc in an F-404 engine. Secondary damage to the flight control and hydraulic systems resulted in the loss of the aircraft. As a result, periodic inspection criteria have been established pending completion of additional engine testing. The second accident, on November 14 at Patuxent River resulted when the aircraft entered a previously unknown spin mode. During subsequent high angle of attack testing, two spin modes were identified. We have developed and successfully tested reliable recovery procedures for each of these two spin modes. A spin demonstration program is scheduled for later this year.

The two accidents notwithstanding, several noteworthy achievements have been logged in the HORNET program. Acceleration and range have been improved and verified by Navy evalution. Considerable progress has been made in air-to-air radar and missile performance. Gunnery testing and accuracy have been impressive. The sortie rates generated at Patuxent River have been higher than predicted and significantly higher than previous programs, reflecting the inherent reliability and maintainability of the HORNET. The Canadian government has selected the F/A-18 as their next state-of-the-art fighter aircraft. Other foreign governments are actively considering procurement of the aircraft.

The fiscal year 1982 request as amended includes $1890.1 million for the production of 63 aircraft in fiscal year 1982, and $236.4 million advance procurement for 84 aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $343.3 million is requested in fiscal year 1982.

CH-53E SUPER STALLION

The CH-53E SUPER STALLION helicopter is the most capable heavylift helicopter in the free world. The SUPER STALLION meets or exceeds all of its performance specifications, and it will satisfy the spectrum of both Navy and Marine Corps heavylift helicopter needs through the end of this century.

THE NAVY MISSION

The Navy will use the SUPER STALLION primarily in the fleet logistic support role. The aircraft is particularly well suited to this mission. It is capable of transporting a 16-ton payload to a 50 nautical mile mission radius, or an 8-ton payload to a range of 500 nautical miles. In the Vertical Onboard Delivery capacity, the CH-53E is able to provide logistic support to ships not in company with an aircraft carrier. This amounts to about 72 percent of our combatants.

In addition to all of these roles, the CH-53E is capable of movement of priority containerized cargo, removal of damaged aircraft, movement of Mobile Construction Batallion equipment and the transportation of nuclear weapons.

The CH-53E also will be employed in the airborne mine countermeasures mission. The greatly increased power and capability of the SUPER STALLION will make it safer and more cost-effective than the present RH-53D aircraft.

THE MARINE CORPS MISSION

The SUPER STALLION satisfies the long-established requirement for a fully capable Marine Corps heavylift helicopter. Our Marines will use the CH-53E in five fundamental mission roles.

Foremost among these missions will be the rapid movement of large numbers of combat troops and heavy weapons and equipment. The ability of the Battlefield Commander to redeploy his forces very quickly, over great distances if need be, can decide the outcome of the engagement.

The SUPER STALLION will increase by about 57 percent the number of pieces of mission-essential heavy combat equipment that may be helo transported. By heavy, I mean equipment weighing over two and one half tons.

The CH-53E is able to lift every tactical aircraft in the Marine Corps inventory--including another CH-53E. This enormous lift capability will allow the Battlefield Commander to move heavy equipment or remove damaged or threatened aircraft.

The Marines will employ the CH-53E in support of its highly mobile V/STOL sites. The SUPER STALLION can move support equipment, deck matting, ordnance and even maintenance vans to support forward-based HARRIERS.

And, finally, the extended range of the CH-53E will permit deep penetration--long range raids, evacuation and rapid response to distant battlefield needs.

A WORD ABOUT COST

The SUPER STALLION has not been immune to the greater-than-expected inflation felt throughout the aerospace industry. We are experiencing unfavorable labor rates and continued increases in the costs of castings and forgings--especially in the high technology lightweight metals that are essential to helicopter manufacture.

The fiscal year 1982 request as amended includes $250.3 million for the production of 14 aircraft, and $22.8 million advance procurement for 14 aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $17.5 million is requested in fiscal year 1982.

SH-2F LAMPS MK I

The SH-2F LAMPS MK I has been operational since the early 1970s. LAMPS MK I has accumulated over 185,000 flight hours including day, night, and all-weather conditions, and over 75,000 landings on ships at sea.

The LAMPS MK I weapon system is comprised of a SH-2F helicopter, built by Kaman, deployed aboard FF 1040 and FF 1052 frigates in the primary role of anti-submarine warfare (ASW). The SH-2F is primarily a reactionary vehicle that responds to submarine contacts gained by the parent ship, other ships in the force, or other ASW aircraft. The aircraft-to-ship data link is used to transmit acoustic information to the ship's combat information center for processing. The LAMPS aircraft has an onboard capability to detect, re-detect and classify and attack enemy submarines.

Our plans are to continue operating the SH-2F into the late 1990s to cover the FF 1040s and FF 1052s until they retire; and to cover the MARK I configured DD 963s, FFG 7s and CG 47s until the LAMPS MK III is in the fleet. The latter ships will be backfitted for LAMPS MK III

In addition to the new SH-2F/LAMPS MK I aircraft included in the amended request, we also are continuing to make more reliable, maintainable and capable our present inventory. Our aircraft modifications request for this year will include, for example, the initiation of the Main Rotor Blade Composite Doubler program. We expect this initiative to reduce significantly the number of rotor blade delaminations attributable to the use of dissimilar materials in areas of high bending.

The fiscal year 1982 request as amended includes $212.6 million for the production of 18 aircraft, and $20.0 million advance procurement for 18 aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $5.4 million is requested in fiscal year 1982.

SH-60B SEAHAWK

The SH-60B SEAHAWK is the airborne subsystem of the Light Airborne Multi-Purpose System (LAMPS) MK III. The total LAMPS MK III system will include the SH-60B, the shipboard electronic subsystem, and the Recovery, Assist, Securing and Traversing (RAST) subsystem. LAMPS MK III will be a computer-integrated ship-helicopter combat system that greatly increases the flexibility, fighting reach and effectiveness of surface combatants.

The LAMPS MK III will be optimized for antisubmarine warfare, but will have as well a secondary mission of Anti-Ship Surveillance and Targeting (ASST).

The SEAHAWK is a derivative of the Army Black Hawk helicopter. It will carry a crew of three, approximately 2000 pounds of integral mission avionics, and will have provisions for sonobuoys and MK-46 torpedoes.

The first SEAHAWK flew in December 1979. Weapon system integration, weapon system flight, NPE-1A, 1N, 1B, SEAHAWK/ship interface test have been completed and SEAHAWK has made at-sea landings on McINERNEY. We are fully confident that the TECHEVAL and OPEVAL will be successfully completed as planned. All indications are that the aircraft will meet all performance specifications. It has not had a major technical problem to date; from that aspect, we are very pleased!

Certainly, I am aware of the interest of the Committee in the cost increases in this program. The lion's share of the $1,174.3 million increase in APN since the December 1979 Selected Acquisition Report (SAR) is attributable to inflation: $746.8 million. The balance, $427.5 million, is attributed to changes--a rather broad category including airframe, engines, Government Furnished Equipment (GFE), System Prime Contractor (SPC), logistic support and spares. The following table displays each category and reflects the increases attributable to changes as well as those resulting from inflation.

APN APPROPRIATION CHANGES
($ in millions)

	CHANGES [1/]	INFLATION	TOTAL
Airframe	+167.6	+270.4	+438.0
Engines	+39.2	+59.9	+99.1
GFE	-80.7	-74.7	-155.4
SPC	+176.7	+252.4	+429.1
Integrated Logistic Support	+50.3	+128.6	+178.9
Spares	+74.4	+110.2	+184.6
	+427.5	+746.8	+1,174.3

[1/] Constant FY 1976 dollars.

As an example of the foregoing, I will take a moment to describe the subelements of the airframe cost increases.

- Composition of the Workforce--over 4000 additional personnel added over the past two and one-half years.
- Material Requirements--leadtimes are increasing, and certain strategic materials costs have increased up to 100 percent over the past year.
- Amount of Tooling--separate lines were established for SEAHAWK and BLACKHAWK. At the major component level, about 75 percent commonality exists between the two aircraft.
- Additional sub-elements include production engineering drawings and substantial increases over original estimates of both engineering and manufacturing manhours.

I hope that this brief summary of a portion of the overall program will help to make more clear the specific reasons for the SH-60B/LAMPS III cost increases.

To summarize, the total program change for the APN appropriation, from the December 1979 SAR to the December 1980 SAR, is $1,174.3 million real dollars. This amount includes $427.5 million in constant fiscal year 1976 dollars for changes, $553.5 million in inflation on the changes, and an additional $193.3 million for added inflation resulting from OMB revised planning factors. The total amount for inflation, then is $746.8 million.

The fiscal year 1982 request as amended includes $585.6 million for the production of 18 aircraft, and $155.3 million advance procurement for 48 aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $30.7 million is requested in fiscal year 1982.

P-3C ORION

The P-3C ORION has maintained a distinguished record since its introduction in 1969. It now ranks as the world's foremost land-based maritime patrol aircraft. In the event of a major war, it will play a pivotal role in the detection and destruction of enemy submarines.

In its current configuration, the P-3C Update II, the aircraft is able to employ the HARPOON air-surface missile system. Additionally, the Update II aircraft have an integrated Infrared Detection Set (IRDS) and an improved Sonobuoy Reference System (SRS). This version of the P-3C has been in production since 1977 and entered fleet service in fiscal year 1978.

With HARPOON the P-3C has expanded its traditional ASW role to include a potent ASUW capability in an anti-shipping role. This new role is in addition to the classical mission of defense of the Battle Group against surfaced missile launching submarines, and surface combatants. A retrofit of HARPOON to other fleet P-3 aircraft commenced in 1980.

ORIONs equipped with Infrared Detection Set (IRDS) are capable of day or night target identification. This capability has special significance in relatively confined, heavily trafficked areas such as the Mediterranean Sea or the Sea of Japan where submarines are frequently detected on the surface at night.

The improved Sonobuoy Locating System (SRS) improves the accuracy of locating information as well as accelerating the localization process. This added capability is directly related to an improved kill probability in the P-3C Update II.

There are presently seventeen of the twenty-four active fleet squadrons flying the P-3C aircraft. The Navy's goal is to achieve an all P-3C active force by 1988 with older P-3A/B aircraft migrating to the thirteen Reserve Patrol Squadrons. There are eight other nations flying the P-3 ORIONs with the Netherlands currently receiving the latest version, the P-3C Update II.

The fiscal year 1982 budget programs the procurement of twelve P-3C aircraft. In addition, the budget contains funds for continued systems improvements to replace obsolescent technology in support of our efforts to match the rapidly improving Soviet naval threat. Among these major upgrades for the P-3C are a new Electronic Support Measures (ESM) system, a new communications systems (fleet satellite communications) and an improved acoustic sensor/localization system. In addition to keeping the active force ahead of the Soviet ASW threat, the amended request also includes funds to maintain an effective deterrent in the P-3 Reserve forces. Among the more significant reserve P-3 modifications are the following:

- Tactical/Navigation Modernization (TACNAVMOD)
- Infrared Detection Sets (IRDS)
- DICASS and triple vernier modification of the AQA-7
- HARPOON air-to-surface Cruise missile
- Secure HF voice (PARKHILL)

The fiscal year 1982 request as amended includes $380.2 million for the production of 12 aircraft, and $84.3 million advance procurement for 12 aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $10.2 million is requested in fiscal year 1982.

E-2C HAWKEYE

The E-2C is the latest of the E-2 family of carrier-based, twin turboprop, airborne early warning (AEW) and control aircraft. The HAWKEYE is equipped with an Airborne Tactical Data System (ATDS), incorporating both active and passive sensors. The HAWKEYE provides real time computer-derived threat warning and tactical analysis to the Task Force Commander. In addition to its primary mission of early warning and fighter control, the HAWKEYE fulfills a vital role in almost every facet of Navy tactical air operations, including surface surveillance coordination, strike force control, search and rescue and air traffic control. The E-2Cs Passive Detection System (PDS) and overland radar detection capability represent a quantum improvement over previous AEW systems.

The E-2C HAWKEYE attained final acceptance for service use in December 1975 and now is being operated by nine of the Navy's twelve carrier-based AEW squadrons and the Fleet Readiness Training Squadrons at Norfolk, Virginia, and San Diego, California. Numerous highly successful deployments have been completed to date, including deployments to the Indian Ocean.

The Advanced Radar Processing System (ARPS) modification to the E-2Cs radar is now being incorporated in all production aircraft. The first ARPS configured E-2C was delivered in December 1976. Procurement of 31 retrofit kits for earlier production E-2Cs was initiated in fiscal year 1977 and installation was begun in 1979. ARPS provides significant radar anti-jam capability, as well as automatic overland detection and increased small target detection range. The system successfully completed Navy Technical Evaluation in September 1977 and Operational Evaluation in April 1978. The ARPS was granted Approval for Service Use (ASU) in September 1978 and deployment of the first fully equipped ARPS squadron occurred in October 1978. Presently, six of the twelve fleet squadrons (all Atlantic Fleet) are completely ARPS equipped. Pacific Fleet ARPS transition starts in mid-1981. Future improvements will include incorporation of a Total Radiation Aperture Control Antenna (TRAC-A), High Speed Date Processing capability and additional computer capacity.

Foreign Military Sales include four E-2C ARPS aircraft for the Israeli Air Force (IAF) in 1978 and four E-2C ARPS aircraft for the Japanese Air Self Defense Force (JASDF) concurrent with the USN fiscal year 1981 buy. Japan has expressed its intent to buy additional E-2Cs in the near future.

The fiscal year 1982 request as amended includes $226.3 million for the production of six aircraft in fiscal year 1982, and $20.5 million advance procurement for six aircraft in fiscal year 1983. In addition, initial spares funding in the amount of $18.5 million is requested in fiscal year 1982.

UC-12B

The UC-12 is an FAA certified, commercial, off-the-shelf, twin turboprop operational support aircraft built by the Beech Aircraft Corporation. The Army and Air Force also use this aircraft. The Navy has approximately 40 of the UC-12s in service now and will take delivery of another 26 over the next 18 months under the currently approved and authorized program.

This aircraft performs a very valuable role in the movement of high priority resupply items and personnel to remote sites and locations not normally served by MAC. Additionally, the UC-12B is employed in medical evacuation and special courier roles. This highly reliable, easily maintained and low operating cost aircraft has already proven to be an enormous improvement over the old, obsolete reciprocating engine models of aircraft it is replacing.

The UC-12B is one of the Navy's aircraft for which the contractor will be providing life cycle maintenance and logistic support.

The fiscal year 1982 request as amended includes $.2 million for support items. The Navy is considering the production of additional UC-12B aircraft to avoid currently projected shortages of operational support aircraft.

C-2 COD

The Navy's unique requirement for carrier-operable logistic aircraft is well known and, I believe, universally endorsed.

One of the pivot points of our ability to conduct sustained, meaningful operations in remote regions is our ability to replenish our ships underway. The bulk of our provisions—food, parts, ammunition and, of course, fuel—are carried to our ships of the line by supply vessels. What gives our system its depth, and its ability to answer supply demands quickly, is our fleet of COD/VOD aircraft. At present, our fleet of COD/VOD aircraft are stretched very thin, and many of our aircraft are unable to meet the demands of a three ocean commitment. We are augmenting our COD force in the Indian Ocean with a single, heavily oversubscribed US-3A aircraft. Through reprogramming actions approved by the Congress in fiscal years 1979 and 1980, together with a reprogramming request presently before the Congress, we plan to increase our US-3A inventory to four aircraft. We will request additional reprogramming, probably in fiscal year 1982, for two more US-3A aircraft, for a total inventory of six.

Together with our new C-2 COD aircraft and our VOD assets, our ability to resupply our ships at sea will be greatly enhanced and satisfactory to the needs of the fleet. In the meantime, Our C-1 aircraft are very old; they are powered by reciprocating engines requiring high octane fuel. For safety reasons, we have removed this fuel from our carriers. This means these airplanes cannot be refueled on-board.

Our newer C-2 aircraft, while extremely capable, are approaching the end of their useful service lives. A replacement for these aircraft is a matter of urgency.

The Navy's decision to produce improved C-2 COD aircraft was taken in recognition of two essential factors. First is time: we will deliver our new C-2 aircraft in late 1985 or early 1986. The second factor is cost: it is clear that the aircraft that will best meet our valid needs for the lowest unit cost should be the new COD aircraft. The improved C-2 meets these criteria admirably. A third factor is the requisite delay of at least a year associated with a competitive procurement.

The C-2s will embody several airframe and engine improvements currently in our E-2C aircraft. The engines will be improved versions of the more powerful and extremely reliable T-56. We also will include some very significant improvements in corrosion resistance techniques. These technologies were proven in the E-2C aircraft and represent the state-of-the-art in that critical discipline.

The fiscal year 1982 request as amended includes $32.0 million advance procurement for the production of 8 aircraft in fiscal year 1983.

T-34C MENTOR

The T-34C is the new turbo-prop, two place training aircraft which the Navy uses as a primary and basic flight trainer for all student pilots. We first introduced the T-34C in 1976 to replace our inventory of obsolescent reciprocating engine T-34B and T-28 training aircraft. We now own 158 T-34Cs. We have been very happy with the T-34C. It is a highly reliable aircraft, inexpensive to operate, and it performs its mission well. We have not yet completed the retirement of our T-28s. 112 of these aircraft are still being used in our training program. These aircraft were procured in the 1950s and their advanced age is making it increasingly more difficult to operate and maintain them.

Our fiscal year 1981 supplemental request is for the procurement of a total of 60 T-34Cs. These aircraft will permit us to continue the retirement of the T-28 through fiscal year 1983. Our fiscal year 1982 request is for 60 T-34Cs. These aircraft will replace the last T-28 aircraft and will provide an initial inventory of aircraft to sustain force levels in the face of projected losses.

The fiscal year 1981 supplemental request includes $41.6 million for a total of 60 aircraft. The fiscal year 1982 request as amended includes $53.2 million for 60 aircraft, and authorization for 60 aircraft in fiscal year 1983.

TH-57 SEA RANGER

The TH-57 SEA RANGER is the Navy version of the Bell Helicopter Company's commercial model 206. The Navy originally purchased 40 FAA-certified, off-the-shelf, TH-57s in 1968 for use as basic helicopter trainers. We are very satisfied with the TH-57s high productivity, reliability and its low operating cost ($28 per hour).

Over the past twelve years, we have lost only four TH-57s in accidents. In addition to the replacement of losses, we are faced with two other factors involving the need for additional trainers. First, our helicopter pilot training requirements increase significantly over the next six years with the expansion of the LAMPS program and introduction of the CH-53E into the fleet; and, second, the excessive refit and modernization costs of keeping our inventory of more than 100 older H-1 advanced helicopter trainers in service beyond 1982.

For these reasons, we have determined that it would be more advantageous for the Navy to procure additional TH-57s. This action will permit the retirement of the H-1s and will standardize our training helicopter inventory with a single aircraft.

The fiscal year 1981 supplemental request includes $13.5 million for a total of 32 aircraft. The fiscal year 1982 request as amended includes $15.8 million for 30 aircraft, and authorization for 21 aircraft in fiscal year 1983.

EC-130Q TACAMO

The EC-130Q is a highly specialized configuration of the basic C-130 HERCULES aircraft. In the "TACAMO" configuration, these aircraft are outfitted with a very unique communications system.

Our Atlantic TACAMO system has been operational for sixteen years now. We have been tasked to maintain a 100% airborne guard capability for the last seven years. We have taxed the EC-130 aircraft to their limit and operated them at an unusually high utilization rate. This has taken its toll in quickly aging the aircraft and increasing the support costs associated with the program.

Our EC-130 procurements through those funded in fiscal year 1981 were to bring our strength up to 18 aifcraft to enable the establishment of a second TACAMO squadron in the Pacific to meet that requirement.

To maintain our force strength at this level, we must begin replacing our older model EC-130s as they reach the end of their second service lives commencing in fiscal year 1984. Starting with the fiscal year 1982 procurement, we are replacing only the aircraft itself. The communications suite will be removed from the retiring aircraft, refurbished and reinstalled in the replacement. This is in contrast to last year when we procured a full weapon system--aircraft and communication suite, together. You may recall that the unit cost for a full system aircraft was $46 million.

The fiscal year 1982 request as amended includes two aircraft for a total procurement cost of $76.9 million. This amount includes $2.0 million for initial spares.

AIRCRAFT MODIFICATIONS

The Aircraft Modification Program, also known as the Operational and Safety Improvement Program (OSIP), funds incorporation of technical improvements which increase reliability, maintainability, safety and substantially modernize aircraft presently in service. These modifications provide the most expeditious and cost-effective method of responding to the fleet's near-term requirements for improved capability and readiness. The overall program is divided into four major categories: Force Level, Safety, Readiness, and Capability.

Force Level modifications are driven by the necessity to maintain required numbers of operational assets without adequate new aircraft procurement. This category includes CILOP (Conversion in Lieu of Procurement)--considerably improved capabilities in many areas or conversion of an existing aircraft platform to a new mission (quite often to meet expanding threats) and SLEP, (Service Life Extension Program).

Safety modifications are those that pertain to the reduction of aircrew/aircraft attrition in both peacetime and wartime environments.

Readiness modifications include operationally "required" changes (i. e., not mission flyable without them), modifications to increase reliability and maintainability, and changes designed to reduce support costs and repair time.

Capability modifications usually consist of weapons systems and avionics changes, generally to meet new threats or to enable better peformance of the aircraft's designated mission.

Our request for the Aircraft Modification Program in fiscal year 1982 is $977.3 million.

Of the total requested, $120.2 million is for the Force Level program, which includes all conversions (CILOPs) and service life extensions (SLEPs); $406.1 million is for capability enhancement and combat survivability improvements, $392.6 million is for Readiness (mostly Reliability and Maintainability (R&M)) modifications and $58.4 million is for changes to increase safety. Most of the required modifications encompass more than one of the four general modification categories. However, the overall "driver," is the requirement to improve the capabilities of our aircraft to keep them competitive against the threat, as well as changes needed to keep them safely flyable.

Some of the more significant modification programs include, as ongoing programs, the F-4J to S conversion (CILOP) program which extends the aircraft service life for 96 months and incorporates wing leading edge slats to give the aircraft greater operational performance in the air combat role; the H-46 Safety, Reliability and Maintainability update program replaces some airframe structures and integral components, thereby assuring a maintainable aircraft into the mid-1990s; the Rewing program for A-6 aircraft which approach their fatigue life limit, thereby approximately doubling the original service life expectation of the aircraft; a P-3 navigation system improvement which will increase the P-3A/B operational mission effectiveness through extensive improvements in equipment supportability, human engineering, and geotactical navigation performance for aircraft assigned to Reserve squadrons; human engineering, and tactical and geographic navigation performance for aircraft assigned to Reserve squadrons; and the A-7E Forward Looking Infrared (FLIR) program will provide the A-7E a first-pass visual attack capability at night with a bombing accuracy of twice that which can be achieved by radar weapon delivery.

New starts in fiscal year 1982 include the replacement of outdated A-4 ejection seats with up-to-date escape technology; a TF-30-P-414A Component Improvement Program for the F-14 engine to resolve engine shortcomings which have surfaced as a result of exposure to a more demanding environment than originally intended--included will be repairs/reworks/redesigns for low time Low Cycle Fatigue (LCF) parts replacement, for engine stall improvement items, and for improved durability, reliability, and maintainability items; and an

E-2 ALR-59 Passive Detection System Improvement, which will encompass an expansion of the memory as well as internal change to permit additional required software functions to counter changes in the nature of the threat since the original Passive Detection System was designed.

As I mentioned earlier, we are continuing the modernization of our SH-2F/LAMPS MK I aircraft. In addition to the modificatons to improve the reliability and maintainability of the SH-2F, we also are continuing the Avionics Improvement program begun in 1978. Certain of the improvements included in this program not only enhance the performance of the LAMPS I, they also lengthen considerably the time between subsystem failures. Clearly, we gain in terms of capability and reliability in such modifications.

AIRCRAFT SPARES

Aircraft spares are the life blood of naval aviation. They sustain our operations. Spares are divided into three major categories: initial spares, modification spares and replenishment spares.

Initial spares support the aircraft procurement progrm. They include initial outfitting and pipeline quantities of repairable spares for new production and modified aircraft through a demand development period. This demand development period is not more than 18 months after Preliminary Operational Capability (POC) date.

Modification spares are new items for support of the modification of in-service aircraft and equipment through a demand development period.

Replenishment spares are items procured to support all naval aviation programs after the demand development period. Replenishment requirements are forcast using actual demand experience. There are two elements of replenishment spares: basic replenishment and follow-on outfittings. Funds for basic replenishment spares are used to procure components to replace those consumed or lost through attrition. Follow-on replenishment funds are used to procure components for aircraft and weapon system outfittings scheduled to be executed within the fiscal year support period. War reserve requirements are also procured in the replenishment spares line.

The funding request for aircraft spares in fiscal year 1982 is $1546.9 million; $739.8 million for initial spares (including $104.8 million for modification spares) and $807.1 million for replenishment spares.

AIRCRAFT SUPPORT EQUIPMENT AND FACILITIES

Funding in the amount of $372.3 million is requested for fiscal year 1981. These funds will be used to continue the following four programs: Common Ground Equipment, $269.1 million; Aircraft Industrial Facilities, $26.4 million; War Consumables, $3.1 million; and Other Production Charges, $73.7 million.

Common Ground Equipment ($269.1 million)

The equipments included in this category are common to multiple types of aircraft or to aircraft that are out of production. CGE funds are used to acquire such diverse hardware as Automatic Test Equipment (ATE), certain training equipment, aircraft common ground support equipment, and Inventory Control Point (ICP) managed Ground Support Equipment. The funds will permit the procurement of totally new equipment to support new and highly complex airborne systems as well as replacement items to ensure acceptably high levels of service, test and maintenance support of existing systems.

I would particularly like to emphasize the importance of these fiscal resources to the achievement of aviation support equipment standardization goals. The items procured with these funds have broad capability for application to all new weapon systems (e.g., F/A-18 and SH-60B), to the exclusion of having to procure a multitude of equipment which is peculiar to each new weapon system. Cost, logistic support, and operational benefits dictate the procurement and use of more common/multi-purpose support equipment in lieu of unique single-purpose items. The fiscal year 1982 request will allow the execution of an aggressive standardization program to meet avanced and existing weapons system support requirements.

Aircraft Industrial Facilities ($26.4 million)

The funds requested for fiscal year 1981 support calibration equipment, $19.5 million; and contractor facilities, $6.9 million.

The calibration equipments provide the media by which fleet Ground Support Equipment (GSE) is tested and adjusted to ensure accuracy and full operational capability. The GSE, in turn, is used to operate, test and maintain fleet prime weapons systems to ensure that they meet their operational readiness, mission effectiveness, flight safety and personnel safety standards.

The Contractor Facilities funds will provide capital maintenance, modernization, improvements, emergency repairs and fire protection for government-owned aircraft production plants. These projects apply to the Naval Weapons Industrial Reserve Plants (NWIRPs) at Bloomfield, Connecticut; Columbus, Ohio; Dallas, Texas; and Bethpage, New York. The funds also support replacement or restoration and capital maintenance of government-owned production equipment used in Navy programs, and procurement of additional production facilities to support and/or expand programs for new weapons systems that are not supported by the private sector. Among the later category are sound-suppression facilities at NWIRP Calverton, New York.

War Consumables ($3.1 million)

The present budget request will fund the procurement of bomb racks, Multiple Ejection Racks/Triple Ejection Racks adapter kits, external fuel tanks, and similar equipment. Historically, these external stores have high attrition in combat operations.

Other Production Charges ($73.7 million)

The funds requested for fiscal year 1981 include $15.2 million for Government Furnished Equipment (GFE) production support. Production support includes, among other things, repair of damaged or defective GFE, procurement of Navy Stock Fund items associated with fleet installation of modification kits, and testing services.

The funds also will support the procurement of certain Navy avionics equipment for installation in Coast Guard aircraft, and the procurement of reconnaissance and other aerial cameras.

Additionally, the funds will be used for special support requirements resulting from new detachments for out-of-production aircraft, support of these aircraft in established detachments, and contractor shutdown costs.

The greater portion of this request is $40.5 million requested to support the planned ORISKANY airwing. The types of support items procured will be operational and intermediate level support equipment including certain types of test equipment. These equipments will support both the ship itself and the shorebased site.

U.S. MARINE CORPS

STATEMENT OF LT. GEN. WILLIAM J. WHITE

General **WHITE**. Mr. Chairman, let me start by saying that we greatly appreciate this opportunity to make a statement to the committee.

The first thing I would say is that I fully agree with the remarks of Admiral McDonald.

We in marine aviation represent roughly one-third of naval aviation in personnel and in aircraft.

I would like to summarize rather quickly some of the highlights of my written statement and start off with the AV-8B aircraft.

AV-8B

I am not going to go into a great deal of detail, although I am prepared to since we have the program manager along with us, Colonel Orr. I would say that the AV-8B fully meets all the Marine Corps requirements for a light attack aircraft. It is tailor made for the close-air support role. It will have a very high sortie rate. It will enjoy great basing flexibility using unprepared roads, grass strips, helicopter platform ships or the larger carriers.

We do, through the V/STOL technology, escape the vulnerability of preemptive strikes on airfields. That is a byproduct of V/STOL aircraft. I think that is sufficient information on that score, but we can elaborate on any one of those points if you would like.

The program remains on schedule. As a matter of fact we will have our first full-scale development aircraft rolling out in October. So I am quite confident that the AV-8B program, thanks to the support we received over the last several years from Congress, is going to be a very beneficial program for the U.S. Marine Corps and for the Nation.

I would go on next to the F/A-18.

PERFORMANCE STATISTICS OF AV-8A

Senator **RUDMAN**. Could I just interrupt you one moment. What is the gross weight of that aircraft?

General **WHITE**. 12,500.

Senator **RUDMAN**. Is its performance in terms of distance classified? It is a V/STOL aircraft?

General **WHITE**. That is correct.

Senator **RUDMAN**. Is that classified?

General **WHITE**. No, it is not.

Senator **RUDMAN**. What is its landing and takeoff?

General **WHITE**. Well, let me start by saying in a general sense that if we are comparing the older AV-8A, the original Harrier, to the B, that the AV-8B, the new aircraft will have double the range or the payload over the old AV-8A. In talking about range, in a ferry configuration, this aircraft will go 2,460 miles nonrefueled, which is a considerable flight ferry range, using four tanks. So the aircraft has remarkably long legs which translates into deployability to crisis areas without relying on aerial refueling which is very important to us.

Does that respond to your question?

Senator RUDMAN. Well, part of it. I was curious in terms of what its performance was. I am rather surprised to hear you say where it could land. What is its landing and takeoff distance at gross? It is a very small area?

General WHITE. Well, it can rise vertically.

Senator RUDMAN. I know.

General WHITE. We would operate the aircraft with maximum ordnance loads from a 1,200 foot runway length.

Senator RUDMAN. That is what I was asking.

General WHITE. Four football field lengths.

Senator RUDMAN. So you can use unimproved roads and fields.

General WHITE. Grass strips, roads, and parking lots if they were available.

Senator RUDMAN. What is the cruise speed of this aircraft?

General WHITE. Since the cruise speed is a relative term, let me ask the program manager, Colonel Orr, to give a description of the various speed regimes.

Senator RUDMAN. I am asking all these questions about these aircraft because I may have some responsibility in marking up this particular request. So I would like to know a little bit more about what I am talking about.

Colonel ORR. The cruise speed, sir, would be in the area, depending on the loading and the gross weight, of 0.76 to 0.82 indicated Mach number.

General WHITE. It is a subsonic aircraft.

Senator RUDMAN. I understand that, but I was curious in what range.

ROLE OF F/A-18 FOR MARINES

General WHITE. I will proceed then and start to discuss the F/A-18 in relationship to the Marine Corps. Admiral McDonald has already covered the F/A-18 in some detail.

I would like to say the F/A-18 is important to the Marine Corps for three basic reasons.

First of all, we think that the F/A-18 will be a superior fighter aircraft. It also has the potential to be a superior close air support or attack aircraft which the Marine Corps must have. We see no alternative for the Marine Corps 12 fighter squadrons except the F-18 aircraft.

There is one additional factor I would mention and that is the reliability and maintainability figures we see coming out of the various development tests. These figures indicate to us that the F/A-18 will be a very reliable and very easily maintained aircraft, so much so that the squadrons will require less maintenance personnel. This will be important to us in the stage when it is difficult to recruit, train, and retain skilled aviation technicians. This is a bonus effect of the F/A-18. So in total the F/A-18 is a very important program to us.

Senator RUDMAN. I find it remarkable that that aircraft has such a wide range of mission accomplishment because of the vastly different requirements for close-in ground support versus the Navy use.

Your Marine air of course is unique in the way that it is integrated with your infantry brigades or whatever you call them.

Your air support historically has been noted for its accuracy and for its ability to give close and very specific target support to ground troops.

Will this aircraft go slow enough to accomplish that mission?

General WHITE. Yes, we think so, and we think it is going to be entirely possible with the F/A-18 to use it as a fighter aircraft with fighter weapons in the morning and reconfigure it with a different ordnance, such as bombs, rockets, or precision guided munitions and then use it in the close air support role in the afternoon.

Senator RUDMAN. Will it fly slow enough and stable enough to do that?

General WHITE. Yes. That is our definite judgment that this aircraft will be a very good attack aircraft. And, by the way, we use the F-4, our present fighter in this same mode.

Senator RUDMAN. I am aware of that.

General WHITE. So you can see the direct relationship between our current use of the F-4 and our future employment of the F/A-18.

GROUND SUPPORT ROLE FOR F/A-18

Senator RUDMAN. The reason I asked the question is because it is very interesting that the F-86's and the 84's that were used for ground support by the Air Force in Korea were highly inaccurate and almost useless for close-in ground support of infantry in valleys between ridges that had distances of maybe less than 2,000 meters. There is some good historical perspective that has been written about that.

Whereas the Marine aircraft, they were flying World War II aircraft, they were flying Corsairs as a matter of fact, and they would drop everything and come in very slow and were extraordinarily accurate for close-in ground support with munitions.

So from personal experience I would think you would need an aircraft for that kind of ground support mission that could fly very slow and be able to pick out targets.

General WHITE. The key to that kind of attack is, of course, training and practice.

Senator RUDMAN. And nerve.

General WHITE. Yes, and a good bit of nerve. If I may say parenthetically, in the Korean war I controlled strikes as an airborne forward air controller in a light airplane, for all the services and not just the Marine Corps, so I share your opinions, although there were some Air Force squadrons that were simply superb.

Senator RUDMAN. Well, we found that they were very willing but they were too fast and they just couldn't slow down enough. That is why I asked the question of this very aircraft.

What is the slowest speed this 18 will fly on a ground support mission safely?

General WHITE. I cannot answer that question. I will have to ask for some assistance.

John?

Captain WEAVER. The unique feature of this aircraft, sir, is that the wing itself, unlike the F-14, which swings back and comes forward for variations in air speed, the F/A-18 leading edge flap starts going down, and the trailing edge flap goes down. So when you want to come in slow with ordnance that leading edge flap starts going down, decreasing the cord of the wing, increasing the camber and you have a very slow air speed capability. Flying down around the 200 to 250 knot regime which is what you need for the type of mission you deserved.

Senator **RUDMAN**. Thank you.

EA-6B

General **WHITE**. I would like to turn next to the EA-6B Prowler, the electronic warfare aircraft and just mention that Congress is supplying the services, all the services, with sophisticated aircraft. We just talked about the F/A-18. But those types of sophisticated attack and fighter aircraft have to be supported by electronic warfare aircraft. On the battlefields of the future, air battles will be determined by how well we can manage our electronic warfare support.

In my estimation the key to success in the next war will be dependent on EA-6B type of aircraft. I support and the Marine Corps supports continued procurement of the EA-6B.

A-6E

I would go next to the A-6E Intruder which the Marine Corps uses as an all-weather attack aircraft. This aircraft, that during nighttime or in bad weather, can provide close air support to our ground forces.

We are now at a state where we are providing 10 A-6E aircraft to each squadron. We have five A-6E squadrons. I would like to see that number increased to 12. We think 12 is a more satisfactory number of aircraft in our squadrons. So we support the continued procurement of the A-6E. It is very important capability for us.

CH-53E

I would now touch on two helicopter programs and start first with the CH-53 Echo, the Super Stallion, which has to be described as a success story for all concerned because this aircraft will lift an honest 16 tons at sea level on a 90 degree day and take that load——

Senator **RUDMAN**. How much?

General **WHITE**. Sixteen tons at sea level on a 90-degree day and take that very heavy load for 50 nautical miles. It is the only helicopter in the free world that can do that. That means that the aircraft will be able to lift about 90 percent of the equipment found in the Marine Division. We need the requested procurement for that. This procurement will help increase our squadrons to three squadrons. We see the need for three squadrons and the requirement may continue as the Marine divisions increase the weight of their equipment.

I will just point out that we have already stood up our first squadron and expect to get out first aircraft early this summer. So progress is being made toward establishing that capability in the Marine Corps.

HXM

Now, the other helicopter program I would like to discuss goes by the acronym of HXM, which is another way of saying a search for a replacement for our aging fleet of assault CH-46 helicopters and CH-53 A's and D's. We are making a two-pronged attack. Those 46's have to be replaced because of age by the end of this decade, 1990 or 1991.

So we are embarked, and I recognize I am talking R. & D. now, but we are embarked on an effort with Naval Air Systems Command to look at various candidates, collect information, and make a wise decision in 1983.

Senator **Rudman**. General, could you speak up just a little bit. The staff is having a hard time hearing you.

General **White**. But in the meantime we have a significant Safety, Reliability, and Maintainability program which we will run all of our C-46's through to make sure that they have sufficient service life left on their air frames to last until the end of this decade when HXM, whatever HXM happens to be, comes into the fleet Marine force.

AIR LAUNCHED ANTITANK WEAPONS

I would finish up now by talking just for a minute about antitank weapons and I am really talking about precision guided munitions.

The Marine Corps is very mindful that in any engagement we will have in the future, we will be confronted by masses of armor and tanks. So Marine Aviation has a role to support Marine ground forces in destroying or neutralizing to turning aside that armor threat.

To do this successfully, and limit our aircraft losses, we see the need to pursue such efforts as the Laser Maverick, which is a precision-guided munition, find a supergun, which we think we have found in the GAU-12/u 25 millimeter gun, pursue the Laser Zuni, another standoff weapon, the Gator, which is an Air Force program to deliver scatterable mines in front of tanks to channelize or slow them down and, last, the Army's very successful Hellfire program, which is a precision-guided munition to fit on helicopters used for antitank warfare.

MARINE AVIATION RESERVE FORCES

I would close by saying that in all this we should be mindful that the Reserve Forces, and I am speaking now for Marine Aviation Reserve Forces, have suffered from years of neglect. The reasons for this I don't think are important at this point, but I am pointing out that in future years we will have to pay attention to our Reserve Forces so that they have modern equipment. Then if we get into a crisis and have a mobilization, they can join the Regular Forces with modern equipment and share in whatever the crisis may be.

PREPARED STATEMENT

Mr. Chairman, that completes my oral statement. I do have my prepared statement which with your permission, I would like to have inserted in the record I would be happy to answer any questions you may have.

[The statement follows:]

PREPARED STATEMENT OF LT. GEN. WILLIAM J. WHITE

DEPUTY CHIEF OF STAFF FOR AVIATION

U.S. MARINE CORPS

Mr. Chairman and Distinguished Members of the Committee:

I appreciate this opportunity to address you regarding the current status of Marine Aviation. I would like to say at the outset that I fully support Vice Admiral McDonald's statement on the overall status of Naval Aviation. I would also like to thank the members of the Committee for the support they have given the Military Services during the past year.

During his recent appearance before the Senate Armed Services Committee, our Commandant said, "Continuing Global threats require that our readiness, flexibility, and mobility - the hallmarks of the Marine Corps - be enhanced". We in Marine Aviation are acutely aware of this need to enhance our capabilities in order to gain a competitive edge over potential adversaries and their increasingly sophisticated weaponry. At this time, I would like to highlight several modernization programs designed to enhance our aviation capabilities.

This year, as it has been for the past three years, the AV-8B, Harrier, continues to be Marine Aviation's number one modernization program. With its unique vertical/short take-off and landing (V/STOL) capabilities, the AV-8B provides the commander on the modern battlefield with Close Air Support (CAS) responsiveness, basing flexibility, and preemptive strike survivability not found in Conventional Take-Off and Landing aircraft. Not only is the AV-8B a substantial factor in improving the Marine Corps' posture as a flexible force, it is also a critical link to our future goal of an all V/STOL force.

During the past year, the YAV-8B prototype flight demonstation program was completed with all goals being met or exceeded. This success has brought continued active interest, from the United Kingdom and other allied countries which, if subsequently translated into aircraft sales, would have a favorable effect on program cost and NATO Rationalization, Standardization, and Interoperability (RSI). Thanks to the prior support of Congress, the AV-8B program continues toward a 1985 Initial Operating Capability (IOC). The Research, Development, Test, and Evaluation (RDT&E) funding provided in the fiscal year 1981 budget will produce four Full Scale Development (FSD) aircraft, with the first FSD flight scheduled for October 1981. Fiscal year 1981 aircraft procurement (APN) funding of $90 million provides long lead money for 12 pilot production aircraft. I am pleased to report that the current budget request of $231 million will fully fund the fiscal year 1982 RDT&E effort. Additionally, the fiscal year 1982 amended budget contains APN dollars for procurement of the 12 pilot production aircraft. Thus, the amended budget fully funds the AV-8B development and procurement as directed by Congress last year, and permits us to proceed in an orderly fashion toward an AV-8B IOC of 1985.

Another modernization program of major importance is the F/A-18 Hornet. The Marine Corps' capable, but aging, fighter/attack (VMFA) force of F-4 Phantoms will require replacement beginning in fiscal year 1983. The F/A-18, will provide Marine Aviation with a modern weapons platform which offers a credible capability for today's threat and the growth potential to fight into the next two decades. In satisfying the Marine Corps' VMFA requirements, the F/A-18 provides not only a primary air-to-air capability but also a secondary air-to-ground capability which complements the AV-8B.

To date, the F/A-18 has completed approximately 3000 hours of testing in one of the most extensive flight test programs in Naval Aviation history. A major goal of this testing is the identification of problem areas prior to introduction into Marine and Navy tactical squadrons. This approach should result in substantial savings by reducing future costly modification programs which have plagued other aircraft developments in the past. Corrections to problem areas which have emerged are progressing satisfactorily at this time. An additional area of concern is the cost growth in the F/A-18 program, which, although much publicized, is largely attributable to the same inflationary factors which have caused cost increases in other aircraft procurement programs.

The Marine Corps is preparing to receive the initial three Department of the Navy (DON) F/A-18 squadrons commencing in the summer of 1982. Introduction of these squadrons will serve the dual purpose of strengthening the VMFA component of our active structure while freeing F-4 aircraft to modernize our Reserve Fourth Marine Aircraft Wing.

The Marine Corps' current EA-6B Prowler structure was completed last year with the delivery of our 15th aircraft. The Prowler's importance to the Marine Corps in this time of constrained aviation assets, cannot be over-emphasized. Its ability to protect and screen Marine strike forces and CAS aircraft by denying the enemy effective use of early warning and terminal threat radars, makes the EA-6B a force multiplier by reducing potential aircraft attrition due to hostile ground air defense. In addition, the EA-6B provides Electronic Intelligence (ELINT) to the Marine Air Ground Intelligence System (MAGIS) and near real time threat warning to fixed wing and rotary wing aircraft. The six EA-6Bs provided by Congress in fiscal year 81 will assist in maintaining the DON structure of 15 Marine and 36 Navy EA-6Bs, but based on operational requirements, this structure is not adequate. Our objective is to build to at least a structure of 18 Marine and 48 Navy EA-6Bs which, although short of full wartime goals, will more closely meet our current needs. The six EA-6Bs requested in the amended fiscal year 1982 budget represent procurement at the most efficient rate and will maintain the current force structure.

The A-6E Intruder is the only all-weather attack aircraft in the Marine Aviation inventory. Its ability to provide Close Air Support during periods of darkness and adverse weather makes the A-6E a critical resource for the Marine ground commander. The 12 A-6Es provided by Congress in fiscal year 1981 will assist the Marine Corps in maintaining our current structure of 50 aircraft while maintaining a limited production line. The amended fiscal year 1982 budget request for 12 A-6Es, and advanced procurement funding for 12 additional A-6Es in fiscal year 1983, provides for procurement at a cost effective rate of production.

The current and future status of the Marine Corps' medium helicopter force is a subject of considerable concern today. Both the CH-46E and the CH-53A/D inventories are dwindling, and our current assets are not sufficient to meet all Marine Amphibious Force (MAF) ship-to-shore and subsequent-operations-ashore requirements. If inventories are allowed to continue their decline unabated, the MAF ship to shore mission will not be supportable by the early 1990s. The problem of inventory shortfalls is further exacerbated by the decaying material condition of the aging medium helicopter fleet and its inability to survive the threat of the future. To achieve mission objectives, avoid increasing costs of ownership and meet the future threat, a replacement medium helicopter (HXM) is required.

In the HXM Mission Essential Needs Statement (MENS) approved by DOD on 7 Jan 81, an acquisition strategy was outlined which would involve conducting a paper competition to select a solution from industry proposals. Both off-the-shelf and new development candidates would be considered with a source selection being made in 1983. Adequate funds will be required to insure that the source selection board can objectively evaluate all proposals and arrive at an appropriate choice. The fiscal year 1982 budget contains RDT&E funding to commence the HXM Program and I strongly support this request.

Until the HXM comes on line, the Marine Corps must continue to provide a credible medium helicopter force. This is being done through the CH-46E Conversion in Lieu of Procurement (CILOP) and

Safety, Reliability & Maintainability (S,R&M) update programs. The CH-46E CILOP will be completed in fiscal year 1983 and produces an aircraft with increased performance and survivability. The S,R&M update commenced in fiscal year 1981 with additional funding provided in the fiscal year 1982 budget for long lead procurement. This program will improve aircraft availability by 12.5% and extends the service life until HXM enters the inventory in the early 1990s. Funding for the CH-46 CILOP and S,R&M programs in the fiscal year 1982 budget insures that a medium helicopter capability for the Marine Air Ground Team will be maintained through the 1980s.

The Marine Corps' heavy lift capability will increase this year with the activation of our first CH-53E squadron. Of the 49 CH-53E helicopters previously funded by Congress, the Marine Corps will receive 33 aircraft, sufficient for two squadrons. These aircraft will provide lift for the M-198 Howitzer, its prime mover and other important heavy pieces of equipment. To meet the total heavy lift requirements for the ship-to-shore and subsequent-operations-ashore missions, a third squadron of CH-53Es is required. The fiscal year 1982 budget request of 14 aircraft provides an orderly progression toward three 16 plane squadrons plus training, pipeline, and attrition aircraft. Ultimate CH-53E force levels will be sized to provide transport for the Light Armor Vehicle (LAV) and the Mobile Protected Weapons System (MPWS), both important weapons systems for the Marine Corps.

One area of modernization which is receiving particular attention is air delivered anti-armor weapons. Procurement of these weapons has not kept pace with the capabilities of our delivery aircraft and the result has been a decrease in aircraft survivability and weapon effectiveness. This lag in the acquisition of state-of-the-art anti-armor weapons has been accompanied by a dramatic increase in the armor capabilities of the Soviet Union and its client states. To survive and counter the highly mobile threat it will face in the future, the Marine Air Ground Team must have an array of air delivered anti-armor weapons, including stand-off precision guided munitions, area/area denial weapons, and a multi-mission gun. Stand-off weapons allow the delivery aircraft to remain outside the intense anti-aircraft missile envelope thus increasing survivability, a major consideration with today's limited aircraft resources. Area weapons allow broad coverage of enemy armor and canalize armor movement into kill zones. The multi-mission gun provides a back-up capability when other, more preferred weapons are not available. This mix of weapons provides the ground commander with maximum flexibility in meeting and defeating an armor threat. The Marine Corps is considering several near term anti-armor weapons for acquisition.

Laser Maverick is a laser guided missile with a stand-off capability and increased effectiveness against a variety of targets from heavy armor to fortified bunkers. It is particularly valuable in the CAS role because it can be used against targets which are laser designated by the ground commander. Laser Maverick will be used by Navy/Marine tactical aircraft (TACAIR) and will begin Operational Evaluation (OPEVAL) in April 1981 with completion scheduled in September 1981.

Laser Zuni is a conceptual anti-armor weapon which would modify the existing 5" Zuni Rocket with a low cost laser guidance control section. This would provide a limited stand-off anti-armor capability in 37 months from the date of program commencement. Laser Zuni would be employable on all DON TACAIR and the AH-1 Cobra Helicopter without aircraft modification and would act as a training missile/light armored target complement to Laser Maverick. Funding for this program is under consideration at this time.

Hellfire is an anti-tank weapon, currently under development by the Army for use on its AH-64 helicopter. It is also being considered for use on our Marine AH-1 Cobra. Hellfire provides a stand-off capability and improved kill probability over the TOW anti-tank missile currently used by the Cobra, thus improving survivability. RDT&E funding is contained in the amended fiscal year 1982 budget to commence retrofitting the AH-1 Cobra for Hellfire and for modification of the missile to meet shipboard safety requirements.

Gator is an air scatterable land mine weapon which can canalize or slow advancing enemy armor beyond the range of other supporting arms. It is the only near term weapon which can provide an area/area denial capability to Marine ground forces. The United States Air Force is the lead agency for the Gator Program and has provided facilitization funding for GATOR in its fiscal year 1982 budget. Procurement strategy has been based on DON/USAF joint acquisition.

The GAU-12/U 25mm gun is a multi-mission, high rate-of-fire, gatling gun which fires armor piercing (depleted uranium [DU]) and high explosive rounds. It has a wide application against air-to-ground and air-to-air targets and should prove to be the best gun option for the AV-8B. Completion of GAU-12/U testing is scheduled to meet the AV-8B OPEVAL and IOC.

In addition to the substantial anti-armor threat facing the Marine ground commander today, there is an ever increasing air threat. A growing Soviet fixed wing attack force, of considerable sophistication, accompanied by a proliferation of attack helicopters is combining to create a formidable Soviet air threat. To counter this air threat, the battlefield commander must have a ground air defense system of greater density and increased capability. To meet these needs, the Marine Corps is improving its ground air defense capabilities in two areas.

The Stinger is an advanced, man portable, surface-to-air missile designed for use against the low altitude jet/helicopter threat. The Stinger will replace the Redeye System, which is completing its shelf life. The first deliveries are scheduled for June 1981, with an IOC of December 1981. To match the increase in technology provided by the Stinger, the Marine Corps is increasing the number of Forward Anti-Aircraft Defense (FAAD) Platoons in a Marine Aircraft Wing from 1 to 3 to provide greater Stinger depth on the battlefield.

To provide increased air defense for Marine ground installations and vital zones, the Marine Corps is upgrading its two Light AntiAircraft Missile (LAAM) Battalions with improved Hawk (IHAWK) equipment. This IHawk improvement program provides a third launcher section for each Hawk Battery. These so-called Triad batteries will possess a 50% greater engagement capability and with the addition of another Triad battery to each LAAM Battalion in fiscal year 1983, engagement capability will increase by 100% over present capabilities.

To tie our air-to-air and ground-to-air defense capabilities together, the Marine Corps must have a highly mobile air control system which can match the expeditionary role of the Marine Air Ground Team. TAOC-85 is being developed to meet this need and provide a replacement for current air control equipment which will end its service life in 1985. TAOC-85 is a series of highly mobile operations modules which can be used alone or in groups, of up to five, to control both air-to-air and ground-to-air weapons, thus reducing operational costs and technical personnel required. An Engineering Development Model (EDM), consistinng of 6 operations modules, is scheduled for OPEVAL in February 1983 with a projected IOC of 1985.

Aviation logistic support is an integral and vital part of our capability improvement program. At a time when Marine Aviation is faced with increasing worldwide commitments, attendant logistic support takes on paramount importance.

The Navy and the Marine Corps are currently suffering shortages in both air-to-air missiles and air-to-ground ordnance. This has occurred because we have historically expended more munitions in meeting our annual training requirements than have been procured for annual replenishment. For example, Inventory Objective shortfalls currently exist for the Sparrow, Sidewinder, and TOW missiles. Additional shortages also exist in General Purpose Bombs, Laser Guided Bombs, Zuni Rockets, 2.75 inch Rockets, and Machine Gun Ammunition.

As weapons systems age, their readiness is directly related to the adequacy of repair facilities and the depth of spare parts.

Critical spare parts funding deficiencies during fiscal years 1979 and 1980 resulted in a marked decline in mission capable aircraft rates. Although initially underfunded again in fiscal year 1981, the spare parts inventory requirement was ultimately given total funding thanks to Congressional initiatives, however, the residual effects of underfunding in previous years continue to have an adverse impact on overall capabilities.

The fiscal year 1982 budget provides for increased funding in both aviation munitions and aircraft spare parts and I heartily endorse these requests. If Marine Aviation is to possess the readiness and sustainability required to meet today's contingencies, increased logistic support must clearly be one of our highest priorities.

One of the most important parts of Marine Aviation, and one which is too often overlooked, is our Marine Air Reserve component. I cannot over-emphasize the importance of modernizing this most significant part of our force.

The Marine Corps' goal is to reorganize its air reserve component - the Fourth Marine Aircraft Wing - by increasing force levels and introducing newer aircraft. Ultimately, we hope to have the Fourth Wing operating the same aircraft that the regular establishment is flying. This will enhance the Wing's combat capabilities in any extended combat scenario by simplifying and expediting its integration into the active force. Possible near term force level increases in F-4s, OV-10s, AH-1s, and KC-130s are planned. Current and projected inventory levels should allow the proposed F-4, OV-10, and AH-1 increases to take place. Any KC-130 increases will require additional procurement but this will provide the reserves with a much needed additional capability in the critical area of intra-theater aerial refueling and transport.

This concludes my formal statement and I am now prepared to answer any questions that you may have.

DEPARTMENT OF THE NAVY

STATEMENT OF REAR ADM. D. P. ROANE

WEAPONS PROCUREMENT

Senator **RUDMAN**. Admiral Roane.

Admiral **ROANE**. We are going to shift from the procurement of aircraft now to the procurement of weapons. The number of kinds of weapons we procure are pretty broad. I am going to talk about the missiles, the torpedoes, the mines and also some gun mounts, targets, support and support product improvements.

I obviously can't hit all of those this morning. They are in my prepared statement.

Senator **RUDMAN**. We have your statement and certainly it will be read and we may have additional questions after getting through your statement.

As we discussed earlier, Admiral, if you would keep this unclassified and then when we get to the question period if we have some questions we will certainly clear the room at that time.

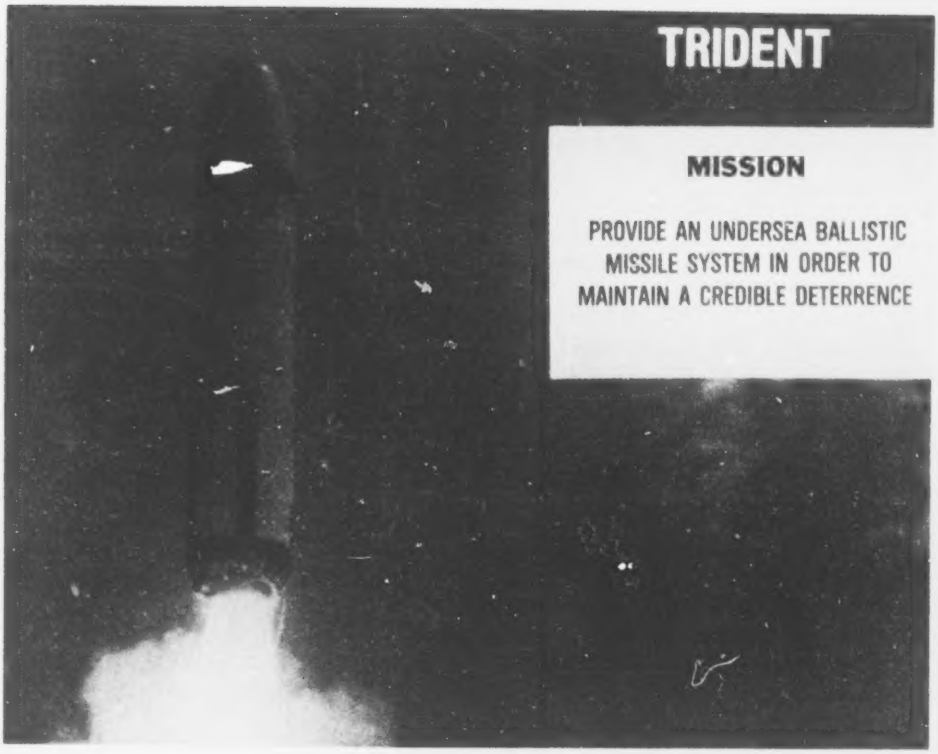
Admiral **ROANE**. Yes, sir.

I think of the ammunition portion of this as that part of the Navy's mission which allows it to conduct prompt and sustained combat operations at sea by having enough ammunition on hand when our forces are called upon.

We have established inventory objectives based on our own weapons, based on the enemy's forces and based on anticipated scenarios. We have inventory objectives to which we procure.

The Chief of Naval Operations has noted in testimony this year that we are short in many categories of modern weapons. Mr. Chairman, you noted earlier that at least we are making some recompense, and our budget request reflects on increase this year, of about 19 percent, $2.7 to $3.3 billion.

Sir, if I may, I will just go through the categories to refresh you on the kinds of weapons that we are procuring.



TRIDENT

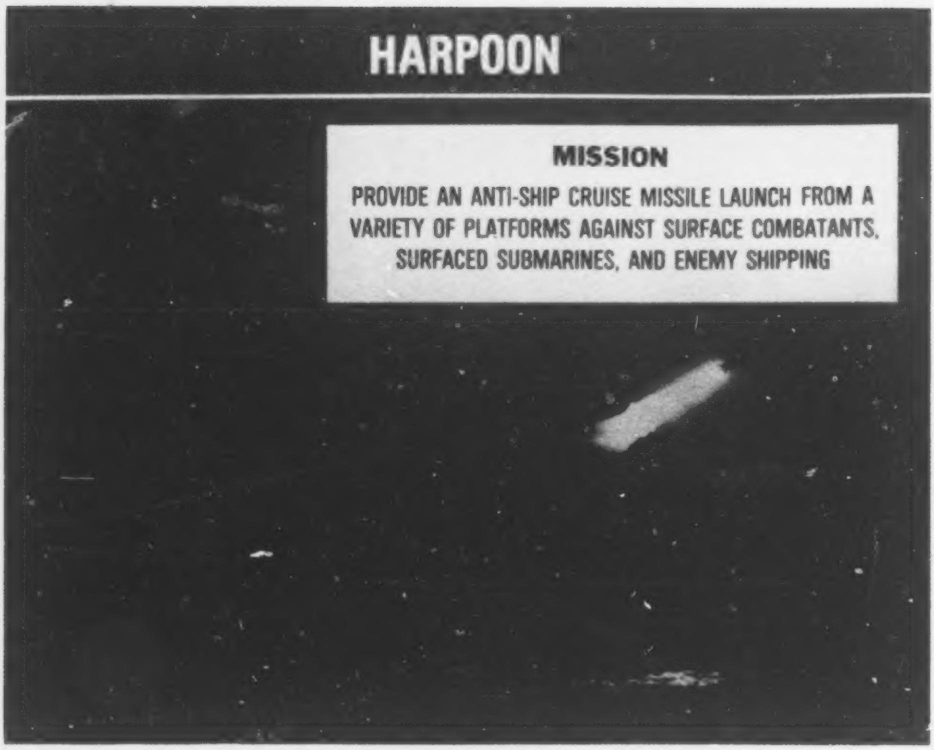
MISSION

PROVIDE AN UNDERSEA BALLISTIC MISSILE SYSTEM IN ORDER TO MAINTAIN A CREDIBLE DETERRENCE

CHART 8

STRATEGIC MISSILES

First is the strategic missiles. This procurement account provides the Trident missile. That is the one that approximately doubles the range of the Poseidon which has been developed with our forces for several years. It will go both into the new Trident submarines and back fitted into the Poseidon submarines that we have in service today. Six of the Poseidon conversions have been completed. We expect to complete the rest of them by the middle of next year.



HARPOON

MISSION

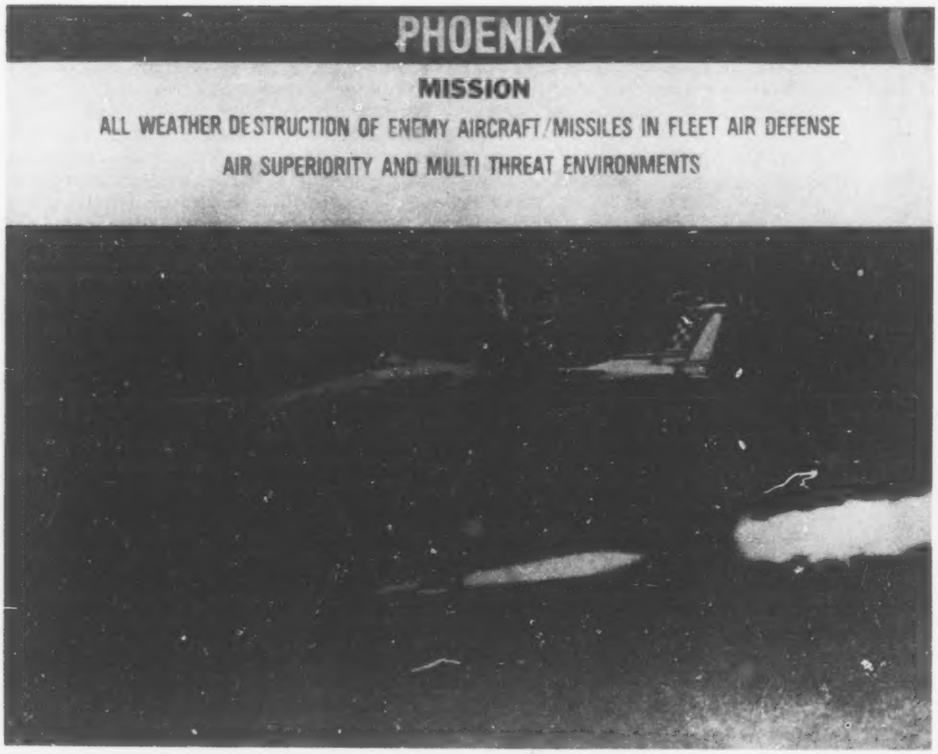
PROVIDE AN ANTI-SHIP CRUISE MISSILE LAUNCH FROM A VARIETY OF PLATFORMS AGAINST SURFACE COMBATANTS, SURFACED SUBMARINES, AND ENEMY SHIPPING

CHART 9

CRUISE MISSILES

Next is the cruise missile category. First is, Harpoon, which has been in service since 1977. We have just certified our 100th surface ship, a hundred ships of our fleet, to carry and to operate the Harpoon. It is in over 20 submarines and it is in over 50 aircraft at the present time.

Our next cruise missile program will be the Tomahawk program which entered production in fiscal year 1980. It will achieve IOC next year in submarines and the following year in surface ships.



PHOENIX

MISSION

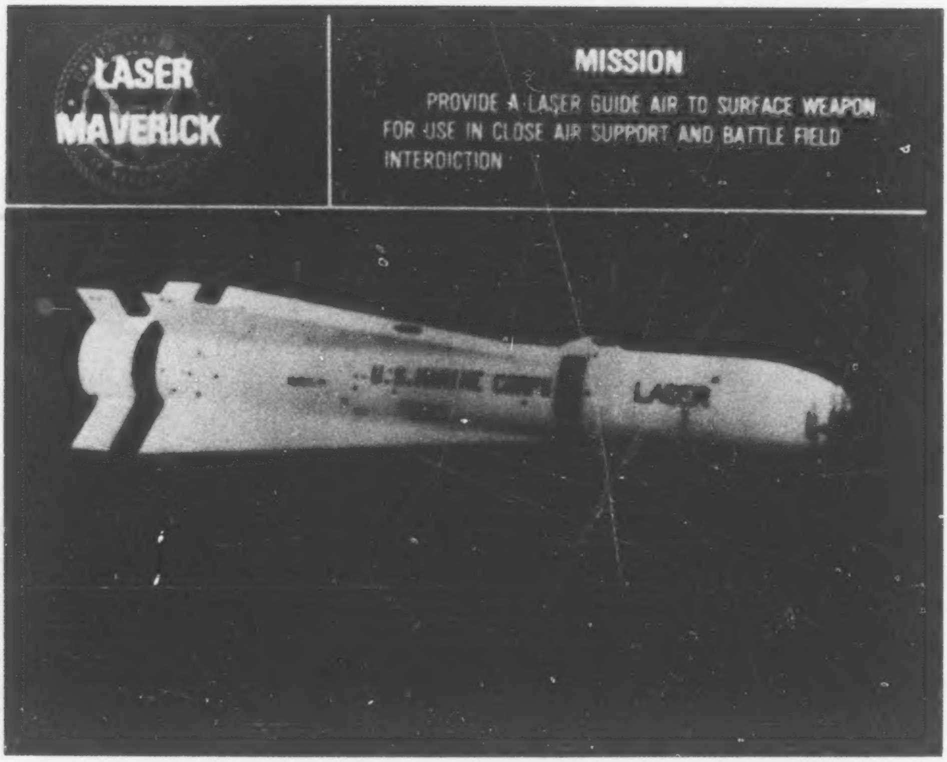
ALL WEATHER DESTRUCTION OF ENEMY AIRCRAFT/MISSILES IN FLEET AIR DEFENSE
AIR SUPERIORITY AND MULTI THREAT ENVIRONMENTS

CHART 10

AIR-TO-AIR MISSILE

The next category we have, sir, is in air-to-air missiles. I have shown here the Phoenix being fired from the F–14. This is our front-line heavyweight air-to-air missile. It is our long-range missile and it is capable of multiple attacks. It is that which makes the F–14, Phoenix and AWG–9 a complete weapons system.

Also in the category of air-to-air missiles are the medium-range Sparrow and the short-range IR homing Sidewinder. The latter two are used in virtually all of our own fighter aircraft. The Air Force procures these weapons as well.



LASER MAVERICK

MISSION

PROVIDE A LASER GUIDE AIR TO SURFACE WEAPON FOR USE IN CLOSE AIR SUPPORT AND BATTLE FIELD INTERDICTION

CHART 11

AIR-TO-SURFACE MISSILES

For air-to-surface missiles, General White just mentioned the Laser Maverick which is going into production engineering in fiscal 1982. We will actually enter production in fiscal 1983. Also in air-to-surface categorizing we are procuring the Harm, high-speed antiradiation missile, which is used for the suppression of enemy air defense on ships and on shore sites. It homes in on the radiating fire control systems to suppress the air defense systems.

SURFACE-TO-AIR MISSILES

If we shift over now to ship-launched missiles for antiaircraft purposes, we have two categories. The first is the short-range Sea Sparrow system which is the same missile as the air Sparrow that I spoke of before with a slight change in the wings and fins to make it compatible with surface launchers.

STANDARD MISSLE-ER

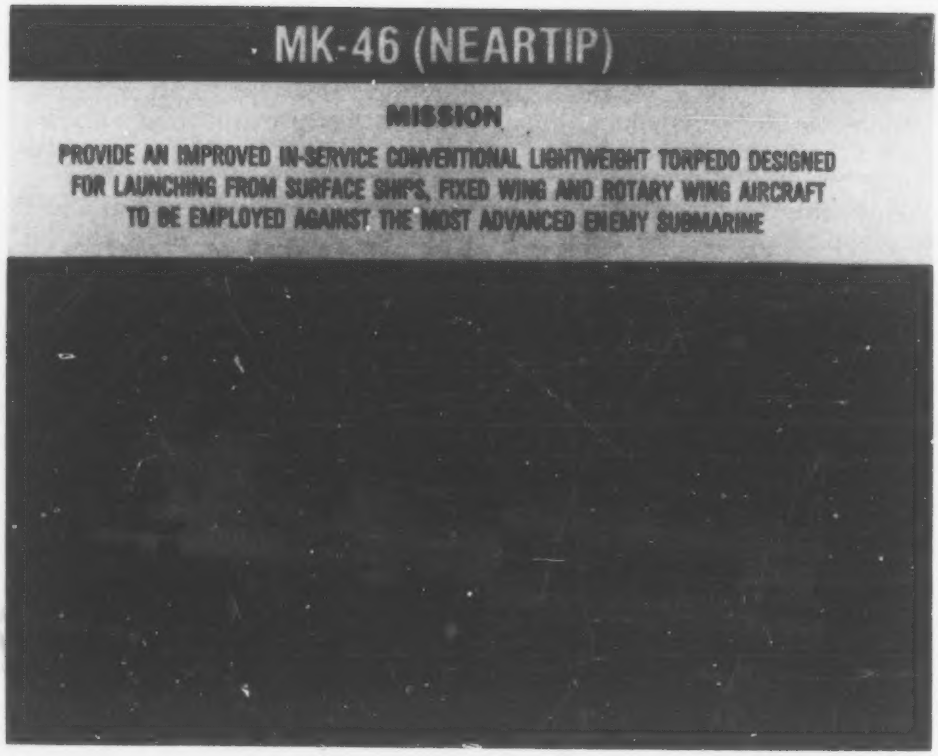
MISSION

ANTI-AIRCRAFT, SURFACE TO AIR GUIDED MISSILE INSTALLED AS PRIMARY ANTI-AIRCRAFT BATTERY IN CRUISERS AND DESTROYERS

CHART 12

STANDARD MISSILE FAMILY

Then we have the mainstay of our surface-to-air or our antiair warfare missile of surface ships. That is the Standard missile family. It is employed on cruisers, destroyers and frigates in the standard missile one version. Standard missile has been in production and has been upgraded since about 1965. We are now in production of the Standard missile II for both cruisers and destroyers. The Standard missile II medium-range will be the missile used by the Aegis cruisers when they enter the fleet in 1983.



MK-46 (NEARTIP)

MISSION

PROVIDE AN IMPROVED IN-SERVICE CONVENTIONAL LIGHTWEIGHT TORPEDO DESIGNED FOR LAUNCHING FROM SURFACE SHIPS, FIXED WING AND ROTARY WING AIRCRAFT TO BE EMPLOYED AGAINST THE MOST ADVANCED ENEMY SUBMARINE

Chart 13

TORPEDOES

Next is the category of torpedoes. We are procuring three types.

One is the MK–48 ASW and antisurface torpedo used by submarines.

The second is the MK–46 torpedo. This is the current version of torpedoes used by surface ships, by helicopters, and by fixed-wing ASW aircraft. It is the mainstay of our above-surface ASW weapons.

The MK–46 torpedo is also the payload of the Captor antisubmarine moored mine that we will use in channels for antisubmarine warfare.

That summarizes generally the major kinds of weapons we procure.

You had asked earlier about the control of costs. We hope this year to proceed with second sourcing on some of our missile systems and are looking very hard at multiyear contracting initiatives that have been mentioned both by the Congress and within OSD. This we think is going to make a big payoff.

That summarizes what can be in depth a rather long list of missiles and weapons, sir.

ANTISUBMARINE WEAPONS

Senator Rudman. What is the major antisubmarine weapon now used by the fleet?

Admiral **Roane**. There are two. The major one fired by submarines is the MK-48 torpedo. The major one used by surface ships, by helicopters and by fixed-wing aircraft, the S-3's and the P-3's is the MK-46 lightweight torpedo.

Senator **Rudman**. Without getting into classified data, it is my understanding that you do have some rather unusual new submarine detection systems under consideration at this time that are being proposed to you by various of your contractors.

Admiral **Roane**. Yes, sir. We are in full-scale development on a number of submarine detection systems. In the surface world we have what we call the passive-towed arrays, which are towed behind the ship. They are used also by submarines. These systems give us the capability to extend our detection range from the immediate vicinity of our ship out to tens of miles. They are what make it important to have LAMPS aircraft in surface ships either LAMPS I for medium range or LAMPS III for extended range prosecution of detections that we make. Our weapons themselves can't fly out that far, so that we must have the LAMPS aircraft to complement them and go out and relocate the target and prosecute the attack at long range.

There are a number of other improvements to the passive capability of the sonars we already have installed in the ships. There are also improvements in the sonobuoys that we carry in our aircraft and there are improvements in the active capability of the sonars that we use. There are a large number of evolutionary upgrades underway or planned.

Senator **Rudman**. I will probably want to close the hearing at the very end of the hearing to discuss one of those projects.

Admiral **Roane**. Yes, sir.

Senator **Rudman**. Do you have anything else?

Admiral **Roane**. No, sir.

Senator **Rudman**. Is this the end of your presentation?

Admiral **Roane**. Yes, sir.

TACAMO/ELF SYSTEMS

Senator **Rudman**. I think we have answered most of the questions that I had as we have gone along here, but I do have one that concerns me a great deal. I just want to ask you one particular question that relates to the TACAMO aircraft.

When Admiral Hayward was here we had a discussion about the ELF program and that program suddenly in the last month seemed to revert to a different status than it had been heretofore. That is presently displeasing to me. I am going to find out more about it, but I think that is not a very wise decision on someone's part who told Admiral Hayward that.

Be that as it may, since I don't make those decisions, if the ELF program does go to a caretaker status then essentially you are relying on the TACAMO aircraft to carry out some of the mission of communications that that ELF program was designed to do. Am I correct on that?

Admiral **McDonald**. We have used the TACAMO to carry on strategic communications, as you are well aware, Mr. Chairman, in the past.

I am not qualified to really give you an evaluation of what ELF would totally do with relation to TACAMO. I think it is fair to presume that TACAMO is going to continue to have the same amount, if not more, emphasis on it. We are looking carefully at going to a new type aircraft to do that.

There is a program, the ECX, which is a follow-on to the EC-1300's which will give us greater potential to carry on strategic communications, sir.

Senator **Rudman**. But those strategic communications which are of vital importance to the Navy to discharge its mission are absolutely dependent on communications and communications in a mode which leads the nuclear missiles for the submarines in the least vulnerable position.

It is my understanding that no matter how many TACAMO aircraft you have or similar aircraft that the communications problems of those submarines needing to be near the surface remains the same. Is that not correct?

Admiral **McDonald**. I think we are getting close to a classified discussion.

Senator **Rudman**. Fine. Let's talk about that when we go into the classified session. What I have said so far happens to be part of what has been written publicly, but beyond that I would like to discuss it with you.

SUBMITTED QUESTIONS

Before going into executive session I have a series of questions to submit to you for response in the record.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

Questions Submitted by Senator Stevens

AIRCRAFT PROCUREMENT

Senator Stevens: What is the Navy's experience in numbers of aircraft lost by attrition and retirement per year?

Admiral McDonald: The data on DON inventory losses due to attrition and retirement for the previous four years, the period during which the Navy carrier force stabilized with 12 airwings, are as follows:

FY	77	78	79	80
Aircraft losses (attrition)	118	120	79	120
Aircraft losses (retirement)	370	367	135	96

Aircraft attrition is largely a function of total operating inventory and force composition, while aircraft retirements are a function of previous procurement history and the average age of the force. Navy SLEP/CILOP programs instituted to maintain force levels as compensation for declining procurement through extensions of inventory aircraft service life have reduced recent retirement rates at the expense of increasing the average age of the force.

Senator Stevens: How does the aircraft procurement for the last four years compare with the Navy's and Marine Corps' experienced attrition and retirement?

Admiral McDonald: The gain and loss inventory data for the previous four years are as follows:

FY	77	78	79	80
New production deliveries	268	257	192	132
Aircraft losses (damage)	118	120	79	120
Aircraft losses (retirement)	370	367	135	96
Authorized procurement	214	181	131	127
Requested procurement	221	169	120	104

As the data indicate, total inventory losses due to damage and retirement exceed either the budget year authorization or those fiscal year new production deliveries resulting from prior year authorizations. The procurement trend reached the point where the budget request was less than aircraft losses due to damage in FY-80.

Senator Stevens: What impact will the increased aircraft procurement requested for fiscal year 1982 have on the Navy aircraft inventory?

Admiral McDonald: Aircraft procured in FY-82 would complete delivery in FY-84. The additional 162 aircraft over the FY-82 FYDP (Carter Budget) procurement request would reverse the projected decline in DON aircraft inventory levels, and provide a basis from which force expansion to 15 CVBG would then be possible.

Senator Stevens: Will there be sufficient aircraft to maintain or increase the existing inventory?

Admiral McDonald: Under FYDP (Carter Budget) procurement, DON aircraft inventory levels were projected to decrease by 152 aircraft between FY-81 and FY-84. The additional 162 aircraft procured under the amended FY-82 (Reagan) budget would lead to a slight inventory increase by FY-84.

AIRCRAFT READINESS

Senator Stevens: What is the Navy's and Marine Corps' experience in maintaining the readiness of aircraft in the operating units?

Admiral McDonald: Navy and Marine Corps readiness rates experienced have been relatively stable since the implementation of the Subsystem Capability and Impact Reporting (SCIR) system. Deployed Marine rates varied during FY-80 from (deleted) averaging (deleted) deployed Navy rates ranged from (deleted) averaging (deleted) for FY-80. Total Navy and Marine deployed rates averaged (deleted) for FY-80 with a low of (deleted). Various improvement programs have been funded and/or are in place which should produce measurable increases in readiness.

SUPPORT FOR SPARES A/C MATERIAL READINESS

Senator Stevens: Have the Navy and Marine Corps operating units experienced low readiness conditions due to a lack of spare parts?

Admiral McDonald: The availability of spare parts is one of several factors reflected in the aircraft material readiness condition of Navy and Marine Corps operating units. The CNO goal for spares availability (deleted) and the current experience (deleted).

Programs to correct availability deficiencies have been developed and are planned for execution over the FYDP.

Marine Corps Readiness

Senator Stevens: Have the Navy and Marine Corps operating units experienced low readiness conditions due to a lack of spare parts?

General White: Previous year funding deficiencies have not permitted stocking to the full range and depth of authorized spare parts, both consumable and repairables to fully support Marine Aviation readiness goals. Our inability to maintain authorized Aviation Consolidated Allowance Lists (AVCAL) inventory objectives has resulted in reduced numbers of aircraft being Full Mission Capable (FMC).

The impact of funding shortfalls for spare/repair parts on operational readiness within Marine Aviation is difficult to assess, specifically when funding is provided to Naval Aviation as a whole. The projection for aircraft readiness, based on Congressional restoration of AVCAL funding, is optimistic.

By way of selective buying of demand items and aggressive management of available resources, the effect on operational readiness in our peacetime scenario has been minimized. However, while these actions may satisfy current tempo requirements, it does not provide the range and depth, particularly for repairables, of supply support necessary to maintain operational readiness at an acceptable level at other than a marginal peacetime tempo of operations. Should a surge in demand occur, due to a commitment of forces, the system could not respond immediately even with increased funding because of industry lead-time requirements.

F/A-18

Senator Stevens: What has the Navy been doing in recent years to improve the reliability and maintainability of aircraft weapon systems?

Admiral McDonald: Over the last 3 to 4 years, the Navy has been working to achieve new standards in reliability and maintainability (R&M). The emphasis is on improved fleet readiness, lower life cycle costs, and enhanced material acquisition efficiency. Reliability and maintainability by design processes now require such things as stress analysis, worst case analysis, sneak circuit analysis, failure mode and effect analysis (FMEA), reliability development testing, and mission profile demonstrations. The F/A-18 program was the first program to invoke all the new design disciplines and the first to heavily incentivize testing and demonstrations. Operational mission environment testing, individual component testing and failure free test requirements have been imposed on the prime and subcontractors. Flight hours were used as contractual and incentive criteria instead of calendar time to better represent fleet conditions.

The reliability demonstration for the aircraft produced 8.4 Mean Flight Hour Between Failure (MFHBF) well above the 3.7 MFHBF required by contract. The direct maintenance man-hour accounting at 2500 hours demonstrated only 6 Direct Maintenance Man-Hour per Flight Hour (DMMHFH), well below the 16 DMMFH requirement. A 6.18 MFHBF aircraft specification has been imposed on the contractor. This is considerably above other aircraft in the Navy.

F-14

Senator Stevens: Is the Navy still experiencing problems in the operation of the TF-30 engine in the F-14 aircraft? If so, what are the problems?

Admiral McDonald: The Navy continues to have problems with the TF-30 engine installed in the F-14 in the areas of stalls and durability. The TF-30-P-414A engine improvement program will address those problems by improving engine stall margin and replacing parts that have insufficient lives with improved, longer life parts. Testing of the improved engine is over 50% complete, and should be finished in September 1981. The engineering change should be approved in October 1981, with first kit deliveries in October 1982.

Senator Stevens: How much has been spent to date to overcome the problems experienced with the TF-30 engine?

Admiral McDonald: The Navy has spent $152.6 million on the TF-30 Component Improvement Program from its initiation in 1968 through December 1980.

MULTI-YEAR CONTRACTING

Senator Stevens: What impact would multi-year procurement have on the aircraft procurements for the Navy and Marine Corps?

Admiral McDonald: It would stabilize production programs and should yield significant savings by ordering materials and components in more economical lots. It should be considered in instances where the mission and inventory needs are clear and the configuration is technically stable.

There are several changes in contracting/budgeting policies, some requiring legislative action, which must be effected prior to commencing expanded multi year procurement. The cancellation ceilings must be revised or removed; recurring costs for both labor and material must be included in the cancellation ceiling; progress payment provisions must be increased and milestone billing provisions provided; the full funding policy would have to be amended to permit expanded use of advance procurement to fund several years requirement for economical lot procurement and the authorization act would have to be amended to permit acquisition of parts and components in excess of authorized weapon systems. Further, it should be recognized that significantly higher appropriations would be needed at the start of multi-year procurements for economic order placing unless laws are enacted to make the cancellation provisions subject to future appropriations.

MULTI-YEAR CONTRACTING

Senator Stevens: Can you cite an example such as the F-18, F-14 and/or AV-8B where the government could save money by multi-year procurement?

Admiral McDonald: The Navy is currently studying several programs for multi-year procurement. The two prime aircraft candidates for fiscal year 1983 appear to be the C-2 and the CH-53E. If successful, other programs including those above would be considered in future years. As a minimum, savings of 10% on the bill of materials, exclusive of inflationary considerations, are foreseen by using this procurement method.

Senator Stevens: Has the Navy taken a position to date on multi-year procurement? If so could you provide the Committee with that position?

Admiral McDonald: We recognize clearly the benefits of multi-year procurement in certain specific cases. We are evaluating carefully the programs that would most benefit by multi-year procurement methods. However, any final position would be contingent upon enabling legislation.

F/A-18

Senator Stevens: What was the original production schedule by year for the F/A-18 aircraft? How does the actual authorized and appropriated production schedule compare to the original F/A-18 production schedule?

Admiral McDonald: The original and the current F/A-18 yearly production procurement schedules are shown side-by-side.

	Capability	
FY	Nov 75	Apr 81
79	15	9
80	30	25
81	72	60
82	108	63
83	108	84
84	108 *	108 *
85	108 *	143 *
86	108 *	209 *
87	108 *	223 *
88	35 *	223 *
89		219 *
Totals	800 *	1366 *

* subject to change

COST GROWTH

Senator Stevens: What has been the Navy's experience in the Weapons Procurement account for cost growth in fiscal years 1980 and 1981?

Admiral Roane: The Weapons Procurement account has experienced a spectrum of cost growth in fiscal year 1980. This growth is the difference between what was appropriated by Congress and what it cost to execute the contract. The variation of 6.0% to 18% is an due to many factors, eg, system maturity, complexity, volume, economic stability and the number of prime contractors with the requisite expertise and capacity. In mature, stable, high volume programs like Standard Missile I medium range, Sidewinder and Harpoon we have been able to restructure the program to procure the number of units approved by Congress. In programs like Captor, Phoenix, CIWS, and MK-46 Torpedo which are smaller in the sense of the number of units authorized we have had to reduce the size of the buy in order to remain within appropriated funds.

In fiscal year 1981 many of the contracts are in the negotiation process. However, the proposals from the prime contractors to date indicate that the weapons procurement account could experience about the same cost growth as was seen in fiscal year 1980. These observed growths are similar to those the aerospace industry.

INFLATION

Senator Stevens: How much is included in the amended Fiscal Year 1982 request for weapons procurement?

Admiral Roane: There is $775 million for inflation in the amended budget for Fiscal Year 1982 for the weapons procurement account. This amount is an application of the Office of Management and Budget rates based on the actual price of goods and services that were in effect during fiscal year 1980.

Senator Stevens: How does this request for inflation compare to Fiscal Year 1981?

Admiral Roane: This compares to $508 million for fiscal year 1981, based on actual prices in effect during fiscal year 1980.

TOMAHAWK

Senator Stevens: What is the Navy's inventory objective for the TOMAHAWK cruise missile?

Admiral Roane: The Navy has established the following preliminary inventory objective for each of the three cruise missile variants:

Anti-ship TOMAHAWK (deleted).
Conventional land attack TOMAHAWK (deleted).
Nuclear land attack TOMAHAWK (deleted).

Senator Stevens: Is the Navy confident that the TOMAHAWK is ready for production and introduction into the fleet?

Admiral Roane: Yes. As you know the cruise missile program includes concurrency to deploy significant new capability in a timely fashion. Thanks to the Congress, limited production was funded beginning in fiscal year 1980. I am pleased to report that flight test program results have been highly successful and indicate that our progress toward an orderly fleet introduction in submarines in 1982, and in surface combatants in 1983, should proceed smoothly and in an orderly manner. The limited scope of TOMAHAWK platforms and missiles in the early years of fleet deployment should permit us to implement the changes and operational employment doctrine implicit in a new weapons system like TOMAHAWK to insure it is used in the most effective and efficient manner possible.

TOMAHAWK and HARPOON Capabilities

Senator Stevens: Although the TOMAHAWK and HARPOON have different ranges and warheads, is there an overlap in the capabilities?

Admiral Roane: The anti-ship variant of TOMAHAWK (TASM) and HARPOON both provide unique capabilities to the fleet over a broad range of anti-ship engagements and scenarios. They overlap capabilities in that both are anti-ship weapons and, if desired, either could be employed over their common range (deleted)-60 nautical miles. However, TOMAHAWK was specifically designed to engage targets at long over-the-horizon ranges out of 250 nm, and as such contains far more sophisticated guidance, seeker and engagement option features than HARPOON. TOMAHAWK search and attack mission profiles can virtually be tailored to a specific scenario - an essential capability for long range over-the-horizon engagements. To achieve this increased capability TOMAHAWK is necessarily somewhat heavier, more sophisticated, and more costly than HARPOON. Conversely, HARPOON was designed to serve as a simple, autonomous, relatively low cost medium range anti-ship missile with universal application to easily retrofitted launch systems on aircraft, surface ships and submarines. Because of its relative technical and operational simplicity, the HARPOON capability will be available on practically all submarines, surface combatants, and P-3/A-6E aircraft in the near future, thereby substantially distributing over-the-horizon firepower throughout the fleet. (Deleted). (Deleted). Thus, HARPOON and TOMAHAWK are uniquely complementary weapons, which provide the firepower balance and flexibility we need across the entire range of anti-ship over-the-horizon engagements.

PHOENIX

Senator Stevens: What is the status of the conversion of the Phoenix missile for the Phoenix A to Phoenix C and how many converted Phoenix C missiles and new construction Phoenix C missiles does the Navy plan to procure to reach their inventory objective ?

Admiral Roane: The current plan is to produce new production and conversion concurrently in order to maximize the procurement of Phoenix C's; and to convert Phoenix A's during the maintenance cycle to return A's to the fleet as Phoenix C's. The Navy plans to procure 1333 new construction Phoenix C missiles and 1599 Phoenix A missiles to reach the procurement objective of (deleted) missiles.

MK 48 TORPEDO

Senator Stevens: What is the inventory objective for the Mark 48 torpedo?

Admiral Roane: The last inventory objective to be approved by the Office of the Secretary of Defense (OSD) is (deleted) torpedoes. This objective was developed in 1978 and no longer accureately reflects the quantity needed to defeat the projected threat. An analytical study completed in January 1981 using the Navy THREAT Model sets a new inventory objective of (deleted) torpedoes. This inventory objective, along with an additional requirement of (deleted) inits to support peacetime expenditures over the service life of the weapon, has been approved within

Senator Stevens: When the MARK 48 torpedo inventory objective is met, how many torpedoes will be in the reserve for reload purposes?

Admiral Roane: When the updated inventory objective of (deleted) torpedoes is achieved, there will be (deleted) torpedoes available for reload above the initial shipfill. (Deleted) more torpedoes will be in the maintenance pipeline and thus not readily available for use.

QUESTIONS SUBMITTED BY SENATOR STENNIS

F/A-18

Senator Stennis: The F/A-18 was initiated on the premise that it would be the "low" end of the hi-low mix with the F-14. Yet it is now more costly than the F-14 and delivers less capability. What can you tell me about this?

A number of technical problems, such as the roll rate, continue to plague the F/A-18. The test program is only 50 percent complete. Yet the Administration increased the request for procurement of this aircraft. Is this really prudent at this point in the test program?

Admiral McDonald: The F/A-18 was designed as a more reliable, maintainable replacement for the F-4 and A-7 embodying both the all-weather F-4 fighter and improved A-7 attack capability in a single airframe to reduce logistic support costs in the fleet. The Hornet is achieving all the above objectives. Only the air-to-ground radar modes remain to be validated by the Navy's Operational Test and Evaluation Forces.

The F/A-18 FY-81 unit flyaway cost is $23.1 million a copy versus the F-14 FY-81 unit flyaway cost of $27.0 million a copy. The F/A-18's are being bought out into the 1990 time frame commencing in 1979. The F-14's were bought from 1969 to the present. While it is difficult to make an accurate comparison of the program unit cost of the two airplanes relative to points of time of procurement on different learning curves, it is noteworthy that the average flyaway unit cost of F/A-18 in FY-75 dollars is $8.42 million as shown in the 31 December 1980 SAR.

The F/A-18 of course is designed as an all-weather air-to-air fighter to complement the F-14/Phoenix weapon system which is the best interceptor in the world today. In the fighter escort role, the F/A-18 forms an ideal complement to the F-14. When the carrier is enroute to the beachhead or strike area, the F/A-18's are used as fighters to assist the F-14 in fleet protection. Uniquely, on Cap station, the F/A-18 can protect the fleet from both air attack and also against surface attack using the Harpoon weapon. The F/A-18 is a versatile, reliable, maintainable weapon system fulfilling the Navy's objectives. The real cost growth for the program is 16% but inflation represents 66% of the program cost reflecting the effects of inflation into the 1990's.

Although the F/A-18 flight test program is about 6 to 7 months behind the 1978 plan, the fighter configuration and respective weapons system development is essentially complete. The technical problems that "plague" the aircraft are due to the severity of testing done earlier than other aircraft programs to ensure a good production article. The high risk items identified have already been tested. Specifically, the digital flight control electronics have proven to be highly reliable; one-man operability has been endorsed as exceptional in the fighter configuration; the radar is exceeding expectations; and the engine development has been extremely successful. The initial roll rate fixes have been tested, but one portion of the envelope, at high speeds below 5000 feet, required additional rate. Testing of the correcton for that area begins this month. The physical configuration audit aircraft is in production and no production problems are anticipated. Increased production rates are more than prudent at this point in the aircraft program.

Senator Stennis: Is it planned for the F/A-18 to carry external fuel tanks on interdiction missions and thereby provide for a reduction in the amount of ordnance that can be carried?

Admiral McDonald: Like all other tactical fighter and attack aircraft, the F/A-18 will at times carry external fuel. The aircraft will carry at least one external tank in virtually all Navy and most Marine interdiction scenarios. However, the F/A-18 has nine external store stations, compared to eight on the A-7 and five on the A-6. The F/A-18 dry weight is about 2,000 lbs. greater than the A-7; the maximum take-off weight is 9,000 lbs. greater than the A-7. The maximum load-carrying capacity of the F/A-18 is therefore 7,000 lbs. greater than the A-7. The F/A-18 carries about 1,000 lbs. more internal fuel than the A-7; the remaining 6,000 lbs. of payload can be used for either fuel or ordnance. External fuel tanks are used on tactical aircraft as a means of increasing range and endurance without reducing ultimate performance.

Senator Stennis: How does the range of the F/A-18 compare with the A-7?

Admiral McDonald: Aircraft range depends on many factors that have varying effects on different aircraft. On the specification profile, F/A-18 range is about 88% of A-7 range. If a FLIR and Laser Spot Tracker are added to the F/A-18 and a FLIR to the A-7, F/A-18 range is 92% of the A-7. Factors can be adjusted to produce almost any desired comparison, however, in general, F/A-18 range is slightly less than the A-7. The F/A-18 range reduction relative to the A-7 was an intentional design tradeoff, calculated to produce superior performance, versatility, reliability, maintainability, and survivability. F/A-18 interdiction range is greater than the threshold established at program inception.

Senator Stennis: During calendar year 1980, the F/A-18 program lost two aircraft. What impact will this have on the program in terms of cost and schedule?

Admiral McDonald: The loss of two aircraft in 1980 has impacted the cost and schedule of the development program, but has had minimal effects on production. Aircraft TF-2 was lost due to a failure of a low pressure turbine disk caused by either a production flaw or structural fatigue. The material used in that disk had already been replaced for production by an improved material; however, retesting of the new material was initiated as a precaution. The cost impact to development was $22.5 million.

Aircraft F-12 was lost to a very slow rate spin mode not previously identified. Automatic recovery techniques did not sense the spin and prevented full control authority. A switch allowing full control has been installed and recovery was demonstrated in over 100 spins. A cost of $14.0 million was incurred to develop and demonstrate the fixes.

COD

Senator Stennis: I understand the Navy has decided on a mix of long, short, and mid-range aircraft for the Carrier Onboard Delivery (COD) mission. What are the alternative aircraft that you are considering for this mission?

The request for advance procurement of long leadtime items for procurement of the C-2 COD aircraft in 1982 is $32 million. This appears to be a relatively large sum for advance procurement. Would you tell us how these funds would be used?

Admiral McDonald: The Navy has concluded that a mix of aircraft types will provide the most effective solution over the broadest range of projected scenarios. The Navy is planning to procure the improved, medium-range, heavy-lift C-2 as the primary COD aircraft because it has been determined to be the lowest acquisition cost alternative which would fully satisfy normal peacetime and projected wartime requirements. A small number of longer range US-3A's will adequately support the high priority requirements in long range scenarios such as the Indian Ocean (IO). With Congressional approval, conversion of three non-ASW S-3A's to the US-3A configuration is in progress to supplement the Navy's lone US-3A now operating in the IO. Two other non-ASW S-3A's are being considered for US-3A conversion, possibly in fiscal year 1982, to provide a desired force of six. The COD airplane (C-2 and US-3) capability will be augmented, as necessary, by the shorter range, very-heavy-lift CH-53E helicopter.

The advance procurement funds requested in fiscal year 1982 for the C-2 is needed for long leadtime items consisting of landing gear, wing flap drive systems, propeller systems and gear boxes, and wheel and brake assemblies. Program termination liability costs are included.

SH-2F

Senator Stennis: The fiscal year 1981 bill includes $20 million in advance procurement funds for long leadtime items leading to procurement of additional SH-2F helicopters for the LAMPS I anti-submarine warfare (ASW) mission. Have these funds been released?

Admiral McDonald: Yes, advance procurement funds for long leadtime items were released to the Navy in late March 1981.

Senator Stennis: The fiscal year 1982 budget amendment includes funds for 18 SH-2F helicopters. Will this be a sole source contract, or are other candidate helicopters available that can meet the Navy's requirement?

Admiral McDonald: No U.S. or foreign helicopters, available or in production, have the capability to perform the LAMPS MK I mission either because of payload limitations, size requirements or shipboard compatibility. A sole source contract is expected to be signed in April 1981.

Senator Stennis: Do you believe there are other helicopters that could perform in this role and be delivered in an earlier time frame than the SH-2F?

Admiral McDonald: There are no U.S. or foreign helicopters, available or in production, that have the capability to perform the LAMPS MK I mission, or which could be delivered earlier than the SH-2F delivery schedule of FY 84.

TRAINER AIRCRAFT

Senator Stennis: Both the Air Force and the Navy are planning to acquire trainer aircraft. Apparently the Navy T-34 aircraft is not acceptable to the Air Force. Is there the possibility that the Air Force Next Generation Trainer (NGT) may be acceptable to the Navy?

Admiral McDonald: The Navy introduced the T-34C in 1977 to provide primary flight training. With expected acquisition and deliveries over the next several years and a service life of about 20 years, we anticipate using the T-34C as the Navy primary trainer until beyond the turn of the century. We are currently monitoring the Air Force development of the NGT and when the requirement exists to replace the T-34C will consider the NGT as a potential candidate to fill our requirement.

TRAINING PILOT CONCEPT

Senator Stennis: The concept of training pilots is apparently different in the Navy and the Air Force. The Navy student pilot receives a common training segment and then receives training in an aircraft designed for a specific mission, whereas the Air Force uses a generalized approach with all students receiving training in the same aircraft. Why is the training different?

Admiral McDonald: The Navy trains pilots for three significantly different categories of aircraft. We use the inexpensive to operate and maintain T-34C in primary training to teach all students the fundamental flying skills and techniques which they will need later in advanced training and throughout their flying career. The primary training also provides the evaluation basis to allow selection of students best suited to a particular category of aircraft. After completion of primary training, student aviators receive intermediate and advanced training in the Maritime (propeller type aircraft) pipeline, the Strike (jet) pipeline, or the helicopter pipeline. The training received in the intermediate and advanced stages provides the knowledge and skills peculiar to our requirements for aviators in the fleet. The Air Force training requirement is almost exclusively for jet qualified aviators and they, therefore, use the T-37B and T-38 to provide the required training.

LAMPS MK III (SH-60B)

Senator Stennis: The LAMPS MK III anti-submarine warfare (ASW) system has experienced tremendous cost increases to where the issue of affordability must be considered. I know the Navy has had a task force looking into all elements of this system. Can you tell us the findings of the task force and whether you feel this program is now under control?

Admiral McDonald: The Secretary of the Navy task force findings are in a draft form and it is expected that the report will be published sometime in April 1981. I will be pleased to provide members of the task force to brief the committee on our findings at your convenience.

Senator Stennis: With almost a 100 percent increase in the past 16 months, do you foresee the possibility of future cost increases?

Admiral McDonald: It is estimated that a potential future cost growth for the LAMPS MK III program of 5 to 15 percent exists. Uncertainty exists over the magnitude of the possible cost increase as the Blue Ribbon panel did not review Integrated Logistic Support, the Recovery Assist, Securing and Traversing (RAST) system or the ship installation portion of the program. These items will be examined separately.

Senator Stennis: What specific action has the Navy taken to stop the upward spiral in program costs?

Admiral McDonald: We see the opportunity to impede cost growth and for potential cost reduction/avoidance in two areas; (1) through a tough contractual fact finding and negotiation process and (2) a redefinition by the Navy of what the various contractors must accomplish. Some specific areas we are looking at include reduction of tooling requirements at General Electric, reduction of engineering man-hours, manufacturing direct labor and overhead at Sikorsky Aircraft, and redefinition of the system prime contractor role and re-examination of proposed IBM program management staffing.

There is no proposed cost reduction figure assigned with these actions. As I mentioned earlier, some actions may provide a cost avoidance rather than cost reduction. Additionally, with the current economic situation, any cost reduction/avoidance action the Navy might successfully achieve could very well be overshadowed by inflationary increases.

Senator Stennis: Is the Navy considering alternatives to the LAMPS MK III program in view of the cost increases?

Admiral McDonald: We have not found any satisfactory alternatives to the LAMPS MK III program. There is no other weapon system in being, or on the design board, that can fulfill the requirement for which the LAMPS MK III weapon system is designed, regardless of cost. There is no more important surface ASW program than LAMPS MK III. If we are to maintain our fragile margin of ASW superiority over the Soviet Navy, we must deploy at the earliest possible date the LAMPS MK III system aboard our newer classes of ships, i.e., FFG-7, DD-963, CG-47 and DDG-993.

Senator Stennis: This system depends on other systems such as the Tactical Towed Array Sonar (TACTAS) and improvements to the MK 46 torpedo for full mission performance. Are you satisfied that these supporting systems are going to achieve full performance specifications?

Admiral McDonald: In testing to date, the SQR-19 Tactical Towed Array Sonar (TACTAS) has met or exceeded all performance specifications. The MK 46 MOD 5 neartip torpedo has satisfactorily demonstrated all performance specifications during its operational evaluation (OPEVAL) in 1977. Subsequent fleet exercises and test firings have confirmed the OPEVAL results.

Senator Stennis: Are you satisfied that the LAMPS MK III will meet the postulated threat to be encountered in the late 1980's and the 1990's?

Admiral McDonald: The LAMPS MK III ship/air weapon system provides multi-mission (ASW, ASST) protection to our Carrier Battle Groups, Convoys, Underway Replenishment Groups, Marine Amphibious Forces and Surface Action Groups. It is the only helicopter that has the longer range, larger payload, better sensors/processors and higher availability, and can safely operate from the surface ships on which it is planned to be embarked. Failure to procure LAMPS MK III will seriously degrade ASW capabilitiea of the FFG-7, DD-963, DDG-993, and CG-47 classes of ships to, at best, a (deleted) counter to the Soviet submarine threat if LAMPS MK I is employed, or to a point defense ASW capability with no LAMPS at all. Further, without LAMPS MK III, these same ships will have a reduced ability to conduct over-the-horizon detection, classification and targeting of potential surface threats.

Senator Stennis: Originally the LAMPS MK III was to have an anti-ship surveillance and targeting (ASST) capability as a primary mission. This is now a secondary mission. Would you discuss why this change was made?

Admiral McDonald: In April 1978, the Senate Armed Services Committee directed the Navy to reduce the cost of the LAMPS MK III program by considering confining it to an ASW mission and eliminating the Anti-Ship Surveillance and Targeting (ASST) capability. The Navy subsequently procured a reduced capability AN/ALQ-142 electronic support measure (ESM) set. This set, (deleted) was adequate to fulfill the WSM role in the ASW mission. The ASST role was then changed from primary to secondary.
role was then changed from primary to secondary.

Senator Stennis: The LAMPS MK III system is extremely cost sensitive to the procurement of the Army's BLACK HAWK helicopter. Do you believe this program has now stabilized and the large cost increases will not be seen in the future?

Admiral McDonald: The increases which have occurred in the LAMPS MK III program have been in the area of future cost projections. The Full Scale Development portion of the program which is currently in progress is within 4% of the estimate made at DSARC IIC in 1978.

The assessment team convened by the Secretary of the Navy to review the costs associated with the LAMPS MK III program recommended, after reviewing approximately 60% of the cost change between December 1979 and December 1980, that an approximate addition of 465 million dollars would be required to properly execute a four year aircraft procurement program. Additional cost changes can be expected to result from the difference between the inflation planning rates which must be used for future costs projections in the out years and the refinement of those estimates through actual experience as the year of program execution approaches.

Other than that which I have mentioned above, I am confident that the LAMPS MK III program has stabilized and large cost increases will not be seen in the future.

Senator Stennis: What about the Recovery, Assist, Securing, and Traversing (RAST) system for LAMPS MK III? Is this now on schedule and meeting performance specifications?

Admiral McDonald: The RAST system is on target to meet all currently planned ship installation schedules. The system was successfully shore-tested at the Naval Air Engineering Center, Lakehurst, New Jersey, in September 1980. The technical evaluation at sea was completed in conjunction with flight envelope development aboard USS MCINERNEY (FFG-8) in January 1981. More than 140 SH-60B helicopter/RAST assisted landings have been conducted aboard USS MCINERNEY. All testing to date has met or exceeded performance specifications.

Senator Stennis: The availability goal of the LAMPS MK III system is 80 percent. Would you tell us about the logistical support the Navy is taking to assure the 80 percent availability goal?

Admiral McDonald: The Navy is currently reassessing the operational availability requirement and the logistical support necessary to achieve a range of operational availability goals.

SH-3H

Senator Stennis: Will the Navy have a continuing need for anti-submarine warfare (ASW) helicopters on aircraft carriers after the carrier task group is equipped with LAMPS MK I and III systems?

Admiral McDonald: The carrier ASW helicopters are integral to our carrier airwings and function with the airwing during the training cycle and work-ups as well as when deployed. The active dipping sonar is considered the best ASW detection device in the inner zone, high noise environment of the carrier battle group.

SH-3H REPLACEMENT

Senator Stennis: The SH-3H Sea King currently performs this mission. What follow-on helicopters are being considered as potential replacements for the Sea King?

Admiral McDonald: The current fleet of SH-3H helicopters commence retirement in 1986 unless a Service Life Extension Program (SLEP) is performed. The Navy is considering a variant of the LAMPS MK III (SH-60B) as a potential replacement for the SH-3H to provide commonality within the battle group and because the airframe is in production and can meet the delivery schedule required by retirement of the SH-3H. This would allow re-programming of the SH-3s (after an airframe service life extension) to alleviate the shortfalls in the shore station SAR and utility/logistics missions.

ADDITION OF AIRCRAFT TO BATTLESHIPS

Senator Stennis: The Navy is apparently considering the use of naval aviation aboard the reactivated battleships NEW JERSEY and IOWA. Is the AV-8B Advanced Harrier the only potential candidate for this mission?

-- I would like your candid views on the additional capability putting aircraft on these ships will give us beyond the existing capability in the battle groups.

Admiral McDonald: The addition of aircraft to any surface combatant has the immediate effect of extending the combat horizon of the ship. Defensively, airborne sensors, whether human eyes, radar or sonar, permit earlier detection, identification and tracking of the threat. Offensively, all airborne resources are quickly redeployable and greatly extend the reach of the tactical commander.

Initially, we are examining the employment of helicopters aboard the reactivated battleships. We will proceed at a deliberate and conservative pace to develop a full understanding of not only the use of these helicopters, but their support needs as well. In addition to multiplying the tactical forces at the disposal of the battle group commander, helicopters also would add depth to logistic support--ship-to-ship transfer of personnel, parts and other commodities--and search and rescue forces.

At some future time we may consider the deployment of the AV-8B or some other V/STOL-type aircraft aboard our battleships, but at this time we have no plans that could be considered much beyond speculation.

Clearly, the addition of aircraft to the battleships would require some alteration of the after portions of the ships, but, in my candid opinion, there is no doubt that the increased depth and reach of offensive, defensive and logistic support forces will be well worth the investment.

RECESS TO EXECUTIVE SESSION

Senator RUDMAN. Because the committee now wishes to discuss certain classified information it will be necessary to clear the room. We will probably stay in that closed session for no more than 10 or 15 minutes and then we will go back into open session briefly for the purposes of recessing the subcommittee.

So we will stand in recess for 5 minutes while we go into classified closed session.

[Whereupon, at 9:45 a.m., the subcommittee recessed in open session to go into executive session.]

Executive Session

AIRCRAFT AND WEAPONS PROCUREMENT

The subcommittee convened in Executive session at 9:45 a.m., in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Warren Rudman presiding.

SONOBUOY PROJECT

Senator **RUDMAN**. I want to pick up the discussion with you now. I had a very interesting briefing by a company that of course you are well familiar with that has done a great deal of work with the Navy over many, many years, particularly in ECM and antisubmarine warfare. That is Sanders Associates, International which has an excellent reputation with the Navy and is one of the largest employers in the State.

I am going to be up there on Tuesday for an all-day briefing by them which I want to get on the whole range of their projects. Many of them are with the Navy.

One of the projects which they briefed me on soon after I took this office was their new sonobuoy project. Are you familiar with that project? That one is currently under consideration by the Navy. I am just interested in the progress.

Admiral **ROANE**. I am personally familiar with it, Senator.

RAPID DEPLOYMENT SURVEILLANCE SYSTEM (RDSS)

Commander **STARK**. I can speak to the extent to say that RDSS is going forward in the Navy. It is a rapid deployment surveillance system [deleted].

Senator **RUDMAN**. I would like to know whether that is going to be an ongoing program.

Commander **STARK**. Yes, sir.

Senator **RUDMAN**. They gave me a briefing. You get the contractor's side of the briefing and obviously they are not going to tell you necessarily what all the shortcomings are, but it certainly seemed from the briefing that it seemed to be conceptually very sound and technologically relatively simple. It had one state-of-the-art kind of problem which had to do with cabling which they solved. I was most curious how that was viewed by the Navy.

Commander **STARK**. The Navy favors the project [deleted]. We have the more or less mobile system of the SURTASS going forward in production, and the rapid deployment capability is anticipated to be fulfilled with the RDSS [deleted].

Senator **RUDMAN**. They have a rather long life, they can be deployed, they are self-powered and have an interesting transmitting system.

Commander **STARK**. [Deleted].

Senator **RUDMAN**. That is right.

Commander **STARK**. The important thing is that it can be monitored [deleted].

Senator **RUDMAN**. In the presentation I had, it seemed rather logical that you could deploy these because of the relatively low cost in places where you had some concerns. If you put them in a large enough grid you could really get some terribly accurate data to your overflying aircraft to give you a pretty good track on traffic. Of course, if it was your own traffic you would have known it was there. If it wasn't then you would know something else.

Commander **Stark**. Yes. It is cheaper than [deleted] sending a ship to surveil remote areas.

Senator **Rudman**. That, of course, is the thrust of my question. The thing that appealed to me about that system was it seemed to give you an enormous amount of intelligence at a relatively low cost with reliability. If one of them didn't work, you just go dump another one. I would like to know, and as that program goes forward I will know it from them, but if problems develop in that program I would like to know about it for two reasons. No. 1, an interest in antisubmarine warfare which is absolutely essential with the Soviet threat, and No. 2, it is a New Hampshire company with an excellent reputation and obviously I am interested in them. So I just wanted to ask that question.

Commander **Stark**. Yes, sir.

Senator **Rudman**. Thank you very much.

Admiral **Seymour**. Senator, it is an R. & D. program right now which is why none of us has got the backup papers on it.

Senator **Rudman**. All right.

TACAMO

Senator **Rudman**. I want to go back to the TACAMO question I asked you. I don't want to put you people in any problems with the CNO. I certainly am not trying to do that, but it seems to me that from what I understand that your TACAMO aircraft or any other kind of system is going to require those vessels to rise to a point where they can then communicate which then puts them in jeopardy. I am wondering if there is something I don't know about the communications system that the TACAMO carries that makes that unnecessary?

Admiral **McDonald**. No, sir. I am not familiar with the connectivity or the technicality as to how the communications are maintained as far as submarine depth and those kinds of things. The connectivity today is maintained through the TACAMO aircraft.

ELF

I think the CNO has passed on his recommendation that the ELF system be put into a caretaker status at the present time and has forwarded that as a proposal. That really has not gone from the Secretary of Defense to the administration or perhaps it is in the process of going forward at the present time. So we are being a little presumptive to judge what the final decision may be, at least, I am, sir.

As far as the connectivity is concerned, we are looking at the (1) affordability of the issue and (2) the vulnerability of the issue. Certainly the aircraft on station has a degree of vulnerability and in fact when detected is highly vulnerable because it has no defensive system right now. We generally have the aircraft located where it is very difficult to defend, but so are any ELF installations, that would pose for us some survivability problems in the future.

So I think there are some tradeoffs that I am not really technically qualified to talk to, including affordability and survivability. As far as connectivity is concerned, I am not as concerned as you may be, and I may be totally uninformed, because we are accommodating that need now. TACAMO is a system that has been proven to be effective in today's world.

What we are trying to do is to increase and to enhance the cabilities of air conductivity systems by upgrading the EC-130 and also trying to develop a new ECX which could be something by one of the major manufacturers like AWACS or something of that kind. I am certainly not suggesting that as the only solution.

Senator **Rudman**. I understand.

Incidentally, I don't know if you know, and you probably don't know this, but there was a referendum held I believe in Wisconsin, wasn't it, and I believe that came out generally not against the program. It was a referendum amongst the people because there had been some hellish environmental concerns up there, as you well know.

My concern very simply stated, and this may be the wrong place to voice it, but you know I have tried to become knowledgeable about some of these systems because I think it is important and is something to be knowledgeable on, and I had a knowledge about them before I ever got here, some of these systems, but it seems to me that with the three legs of the Triad that the only one that seems to be in great shape in my opinion is the Navy right now in terms of its capabilities. We have got all kinds of problems with aging bombers and we have got serious problems about whether the Minutemen even work anymore. I mean, there have been serious concerns.

Here we have a system where we are not in constant communication with those people who may have to receive launch commands. There are situations where we can't communicate with these people and that is why I am very concerned about the recommendation of putting the ELF on a caretaker status. I think probably what I will do is I will want to come over and talk to some of the people who can talk about it.

Admiral **McDonald**. I was going to suggest, sir, that we provide a techical response to your question or we can provide you with briefings by people who are qualified in the area much more so than I am.

COMMUNICATIONS GAPS

Senator **Rudman**. I have some testimony that I have been holding here that I am not going to lay on you this morning because you are the wrong recipients of it, but that testimony from some of your top submarine people has some very profound things to say about the communications gaps that exist.

We spend, you know, this enormous amount of money on this extraordinary technology and accurate targeting and first-class vessels and new weapons and the Trident system itself and we have a communications problem. The testimony from some of these people which I have gleaned from past hearings is of great concern.

I think we will leave that subject.

PREPARED STATEMENT

We will place your prepared statement in the record at this point, Admiral, before returning to open session.

[The statement follows:]

PREPARED STATEMENT OF REAR ADM. DONALD P. ROANE, DIRECTOR
SURFACE COMBATANT SYSTEMS DIVISION
OFFICE OF THE CHIEF OF NAVAL OPERATIONS

Mr. Chairman and members of the Subcommittee:

I am Rear Admiral Donald P. Roane, Director, Surface Combatant Systems Division, Office of the Chief of Naval Operations. It is my privilege to present the munitions requirements for the U.S. Navy contained in the Weapons Procurement, Navy, Appropriation fiscal year 1982 Budget Request as amended, and those items which require authorization in fiscal year 1983.

It is important to recall that the mission of the Navy, as set forth in Title 10, U.S. Code, is to be prepared to conduct prompt and sustained combat operations at sea in support of national interests; in effect it demands maritime superiority for the United States and its allies. Specifically, the Navy must be prepared to seek out and destroy enemy naval forces and to suppress enemy sea commerce, gain and maintain general naval supremacy, control vital sea area and protect vital sea lines of communication, establish and maintain superiority in any area of naval operations, seize and defend advanced naval bases, and conduct such land and air operations as may be essential to the prosecution of a naval campaign. These many kinds of missions can only be "prompt and sustained" when the variety and quantity of required weapons are on hand when called upon to fight.

The inventory objectives which determine procurement requirements for all weapons are continually under review. Their determination is sensitive to estimated enemy order of battle and defensive capabilities; the anticipated scenario; our own demonstrated weapon system capabilities; logistic requirements including weapon distribution to fighting units; and battle attrition on both sides. Thus, determination of inventory requirements results from a logical and systematic evaluation of a number of sensitive parameters, the results of which establish minimum prudent ammunition levels rather than absolute ultimate requirements upon which to base our war fighting preparedness. Since inventory objectives are sensitive to a number of factors which are variable in nature, inventory objectives may change and requirements for procurement may vary from year to year. More specifically the Navy's non-nuclear ordnance inventory objectives are computed by a mathematical model. Two different types of munitions form the bulk of the requirements.

The first type is Threat Oriented Weapons. These are munitions used to neutralize the enemy order-of-battle that he can not regenerate rapidly (Submarines, surface combatants, aircraft). The changing nature of armaments dictates that we now determine our own ordnance requirements partially on the requirement to engage enemy weapons - specifically those cruise missiles which are targetted at our own forces. These items include air-to-air missiles, surface and sub-surface launched missiles, torpedoes and anti-submarine mines. The requirements are based on the number of and types of targets, weapon system effectiveness against a target class, variations among friendly platforms, false target expenditures, attrition to friendly forces and availability and method of ordnance replenishment. Requirements are based on targets and are not time phased.

Threat oriented munitions are procured by the Weapons Procurement, Navy appropriation.

Threat-Oriented Weapons requirements for fiscal year 1982 are computed in terms of the number of individual weapon requirements as illustrated below:

SURFACE TO SURFACE MISSILES

	FY-82
TOMAHAWK	[Deleted]
HARPOON	
AIR LAUNCHED MISSILES	[Deleted]
AIR SPARROW	
SIDEWINDER	
PHOENIX	
SURFACE LAUNCHED MISSILES	[Deleted]
STANDARD MISSILE	
MEDIUM RANGE	
EXTENDED RANGE	

SEA SPARROW
ASW MUNITIONS
MK-48 TORPEDO
MK-46 MOD 5 TORPEDO
CAPTOR ASW MINE

[Deleted]

The computation of the individual weapon requirement is the minimum prudent level upon which our war fighting preparedness at the [Deleted] distribution factor is based. The distribution factor is that probability our ship or aircraft will have the ordnance onboard to neutralize the threat that is engaged at the time of engagement.

The programming level of this budget request is designed to achieve a [Deleted] [Deleted] distribution factor by the end of the [Deleted] funded delivery period as previously directed by the Office of the Secreatary of Defense during the development of the fiscal year 1982 budget.

The second type of munition procured is Level of Effort ordnance. These are items used to neutralize the enemy order-of-battle that the enemy has the ability to rapidly regenerate (personnel, tanks, etc.). Weapons included are air-to-ground missiles, air delivered munitions and ship gun ammunition. Requirements are time phased and are based on delivery capability, e.g. number of sorties or missions per day.

Level of effort weapons requirements are computed in terms of days of supply for a given scenario:

[Deleted] for Worldwide NATO Forces
[Deleted] for US and ROK Forces in Korea
[Deleted] for Rapid Deployment Force or [Deleted] for US and ROK Forces in Korea.
[Deleted] for Worldwide NATO Force or [deleted] for US and ROK Force in Korea [deleted] warning time pre-D-day for sonobuoys
Shipping losses for NATO Forces

The above has been modified by the Consolidated Guidance which limits level-of-effort munitions procurement to the following Procurement Objectives:

SCENARIO	Days of Supply
Worldwide NATO	
Rapid Deployment Forces	[Deleted]
US Forces in Korea	[Deleted]
ROK Forces in Korea	[Deleted]
Sonobuoy Warning	
Shipping Losses	YES

* Limit for modern weapons like [Deleted] [Deleted]

After achieving the above procurement objective, a warm production base is to be maintained until the Inventory Objective is achieved.

The procurement requirements contained in this year's request as amended reflect an effort toward achieving the inventory requirements in balance with overall fiscal realities.

The Weapons Procurement, Navy appropriation is composed of four budget activities. Activity One includes procurement of ballistic missiles, and navigation satellite system requirements. Activity Two includes other missiles such as air, surface and subsurface launched missiles, and aerial targets. Activity Three includes torpedoes, mines, and subsurface training targets. Activity Four includes naval guns and associated support equipment. Also provided for, within each appropriate budget activity, is modification to in-service weapons; initial and replenishment spares and repair parts; and industrial facilities and tools unique to the production and maintenance of the missiles and other ordnance items procured within the appropriation.

The prominent features of the fiscal year 1982 Weapons Procurement, Navy Budget Request as amended are:

STRATEGIC WEAPONS

-- The continued production of the TRIDENT I ballistic missile.

SURFACE TO SURFACE MISSILE

-- Continued production of the TOMAHAWK cruise missile

-- Continued production of the HARPOON anti-ship cruise missile.

AIR TO AIR MISSILES

-- Continued production of SPARROW, SIDEWINDER and PHOENIX air-to-air tactical missiles.

SHIP LAUNCHED MISSILES

-- Continued production of the STANDARD SM-1 and SM-2 Medium Range Missiles and the improved STANDARD SM-2 Extended Range Missile.

— Continued production of the NATO SEASPARROW Missile.

AIR TO GROUND MUNITIONS

-- Initial production support for the LASER MAVERICK Missile.
-- Continued production of the HARM Anti-Radiation Missile.

ASW MUNITIONS

-- Continued production of the MK-48 Torpedo.
-- Continued production of the MK-46 NEARTIP Torpedo.
-- Continued production of the CAPTOR MK-60 ASW Mine.
-- Initial procurement of the Submarine Launched Mobile Mine.

SHIP DEFENSE

-- Continued production of the PHALANX Close-In Weapon System.
-- Final production of the MK-75/76MM gun for the U.S. Coast Guard.

The fiscal year 1982 total request of about $3.271 billion is an increase of about 19% over the approximately $2.738 billion appropriated for fiscal year 1981. With your permission, Mr. Chairman, I would like to address each of these programs in some detail, in order of budget activity.

BUDGET ACTIVITY I

BALLISTIC MISSILES

Budget Activity I provides for the procurement of fleet ballistic missiles, ancillary checkout and support equipment and the modification and improvement of facilities required to support the delivery of these missiles to the sea-based strategic deterrent forces. Of the $958.9 million requested in fiscal year 1982, $928.6 million is for ballistic missiles; $10.1 million is for missile modifications; and $20.1 million is for support equipment, spare parts, industrial facilities and astronautics.

POSEIDON

POSEIDON missiles are no longer being procured; however, funding is requested to support missile tests which will continue throughout the operational lives of the weapons. This is necessary in order to continue to evaluate the readiness of deployed missiles in accordance with Joint Chiefs of Staff test criteria. The fiscal year 1982 budget includes funds for special purpose flight test instrumentation components and Department of Defense components delivered to the Department of Energy for POSEIDON warhead assembly. $18.7 million is requested for POSEIDON for fiscal year 1982. For fiscal year 1983, authorization is requested for $10.2 million.

(VG-1)

TRIDENT

The TRIDENT program provides an undersea strategic missile system that ensures this country continues to maintain a credible, survivable deterrent which is independent of foreseeable threats throughout the decade and beyond. The portion of the strategic ballistic missile force at sea is the least vulnerable element of our nation's strategic forces. To insure their continued survivability and effectiveness we must expand the SSBN's weapon capabilities beyond those of the current POSEIDON. We are, therefore, requesting continued production of the TRIDENT I missile which will be deployed in the TRIDENT submarine, as well as backfitted into twelve of the existing POSEIDON fleet ballistic missile submarines. The TRIDENT I missile will carry a full payload with the delivery accuracy of POSEIDON, but at double the POSEIDON range.

The total fiscal year 1982 request for TRIDENT I missile procurement is $909.9 million. $665.1 million of this total is requested for 72 missiles for the combined TRIDENT and TRIDENT backfit program. The remaining $244.8 million is requested for the advance procurement of various components of the Trident missile in support of future procurements. For fiscal year 1983, a total authorization of $906.2 million is requested for procurement of 72 TRIDENT I missiles ($680.5 million) and for advance procurement for follow-on missile buys ($225.7 million).

MODIFICATION OF MISSILES

Missile modifications are determined only after thorough investigation has established the need for a change in system or equipment configuration, the total estimated cost and the impact of a proposed change has been defined and the proposal is subjected to severe screening to determine a positive advantage to the system. POSEIDON modifications are funded only when correction of a known deficiency is required, a component is no longer procurable in its original configuration or it is necessary to accept a substitute part of an existing subassembly. The fiscal year 1982 request for modification of POSEIDON missiles is $10.1 million. For fiscal year 1983, authorization is requested for $7.5 million for the POSEIDON missile modifications.

SUPPORT EQUIPMENT AND FACILITIES

The support funds requested in Budget Activity I are for initial and replenishment spares and repair parts, maintenance of missile industrial facilities and astronautics. The fiscal year 1982 request for support equipment and facilities is $20.2 million. For fiscal year 1983, authorization is requested for $13.1 million for support equipment and facilities.

BUDGET ACTIVITY II

OTHER MISSILES

Budget Activity II provides for the procurement, modification and support of air-to-air, air-to-surface, surface-to-surface and surface-to-air missiles for inventory, combat, training; and the procurement of aerial targets. The Budget Activity II procurement plan for the missiles is designed to establish and maintain an effective mix of weapons in the combat inventory and to provide weapons in support of training. In developing the procurement plan, we consider such factors as production feasibility and delivery schedules for the weapons, and the availability of the ships and aircraft which can employ them. The fiscal year 1982 budget request provides funding of $1.60 billion for the procurement, modification and support of these missiles and aerial targets.

SURFACE-TO-SURFACE

(VG-2)

TOMAHAWK

The TOMAHAWK Cruise Missile is a long range missile with land attack and anti-ship models, sized to fit submarine torpedo tubes as well as surface ship and aircraft launchers and capable of being deployed from a variety of subsurface, surface and air platforms. The TOMAHAWK Cruise Missile is propelled in flight by a small turbofan engine. The antiship version uses a modified HARPOON guidance system and the land attack version has inertial and terrain contour matching guidance system. The antiship version is fitted with a high explosive warhead while the land attack version can be fitted with either the high explosive or a nuclear warhead. The Defense System Acquisition Review Council (DSARC II) was completed for TOMAHAWK in January 1977, and the Secretary of Defense approved the weapon entering into full scale engineering development for both the land attack and anti-ship models.

$224.9 million is request for fiscal year 1982 to fund the procurement of 88 TOMAHAWK missiles. Authorization for 93 missiles for $236.8 million is requested for fiscal year 1983.

(VG-3)

HARPOON

The HARPOON Cruise Missile was designed to provide a ship, air and submarine launched all weather anti-ship cruise missile effective against enemy surface combatants and merchant shipping. The radar-guided HARPOON was first operational in the fleet in July 1977, installed in both surface combatants and submarines. An alternative version has been adapted for launch from aircraft and achieved initial operational capability in 1979.

HARPOON is a formidable weapon and one that adds measurably to fleet offensive capability. It is essential that we maintain this program and continue fleet introduction as rapidly as possible.

For fiscal year 1982, we are requesting $300.7 million for 340 missiles and for 1983 we are requesting authorization for 340 missiles at $273.5 million.

AIR-TO-AIR MISSILES

The Navy's air-to-air weapon inventory includes three missiles: the 200-pound SIDEWINDER, a short range weapon using a passive infrared seeker; the medium range 500-pound SPARROW, guided by a semi-active radar seeker; and the 980-pound PHOENIX, a long-range missile using a combined semi-active and active radar seeker. The SIDEWINDER, SPARROW and PHOENIX current capabilities are significant and satisfy the requirements they were designed to meet. Increased capability to counter the projected threat is being incorporated through ongoing product improvement programs.

(VG-4)

SPARROW

The AIM/RIM-7M SPARROW III is a semi-active medium range intercept missile and will be employed by Navy F-4, F-14 and F/A-18 fighter aircraft and surface ships having the NATO SEASPARROW system.

The entire fiscal year 1982 request is for the 7M monopulse variant of the SPARROW missile and will include the second production of the RIM-7M missile for sea-launched application in surface ships. The AIM-7M and RIM-7M missiles are nearly identical with the only differences being folding wings, clipped fins and remote arming capability for the RIM-7M surface-to-air missile. The AIM-7M will be compatible with all aircraft currently approved to carry the AIM-7F air-to-air missile, and the RIM-7M will be employed with the NATO SEASPARROW Surface Missile system.

The 7M variant of the SPARROW missile incorporates a new low altitude capable active fuze, and a new target seeker featuring improved missile guidance performance in electronic countermeasures and clutter environments. Performance limitations in these areas were inherent in the AIM-7F conical scan seeker design. The 7M derives its enhanced guidance through use of monopulse radar, but uses the same airframe, warhead, and rocket motor as its predecessor, the AIM-7F.

We expect the 7M to be fully operationally capable in the face of known self-screening electronic countermeasures, and it will provide improved capability in other ECM environments.

We are requesting $144.7 million for 475 AIM-7M and 430 RIM-7M missiles in fiscal year 1982. For fiscal year 1983, authorization is requested for 1185 missiles at $162.3 million.

(VG-5)

SIDEWINDER

The SIDEWINDER AIM-9M is the latest version in the series of infrared seeking short range air-to-air missiles and it will be used on Navy and Marine Corps fighters and some light attack aircraft.

The AIM-9M has a significantly improved infrared counter-countermeasure capability and a 50% improvement in its ability to acquire a target against a strong infrared background (such as a hot desert). In other areas of performance and reliability the AIM-9M retains the same capability as the highly successful all aspect AIM-9L. The AIM-9M electronics have been repackaged to use more modern manufacturing methods and to facilitate repair.

We are requesting $49.5 million for 910 AIM-9M missiles in fiscal year 1982 and authorization for 500 missiles at $52.5 million in fiscal year 1983.

(VG-6)

PHOENIX

The AIM-54 PHOENIX, an all-weather missile, employs semi-active, mid-course and active guidance. The PHOENIX system utilized for the F-14 aircraft has unique capabilities not matched by any other air-to-air system. It has successfully demonstrated a capability against high altitude and high speed targets, and a high degree of effectiveness during multiple and long range engagements.

A development program to update selected units of the PHOENIX missile commenced in fiscal year 1977. This new missile, designated AIM-54C, incorporates state-of-the-art technology and provides increased missile performance, reliability and readiness. The first low-rate production of 60 AIM-54C missiles commenced in fiscal year 1980.

For fiscal year 1982, the Navy is requesting $167.0 million for 72 AIM-54C PHOENIX missiles of which $26.2 million is for advance procurement of long lead items required to support the fiscal year 1983 buy. For fiscal year 1983 we are requesting authorization for 270 missiles at $318.5 million, which includes $39.4 million for advance procurement.

AIR-TO-SURFACE MISSILES

(VG-7)

LASER MAVERICK

LASER MAVERICK is an air-to-surface short range semi-active laser guided missile with a penetrating blast/fragmentation warhead. LASER MAVERICK is a variant of the Air Force's TV guided missile modified to incorporate a semi-active laser seeker, a general purpose blast/pentration warhead and USAF an out-of-line arm and fire device for a reduce smoke rocket motor. The missile is currently planned for Marine Corps use only, but will be employed with a single rail launcher adaptable to both Navy and Marine Corps tactical aircraft.

LASER MAVERICK will be used in close air support/battlefield interdiction mission to attack enemy installations, equipments and supplies within the Amphibious Objective Area (AOA) and in deep support for the destruction of targets outside the AOA. In anti-air warfare, LASER MAVERICK will be used to attack hostile aircraft on the ground, missile sites and to neutralize radar installations and air support areas. This weapon with its cockpit selectable fuze and penetrating blast-fragmentation warhead offers a highly versatile capability against a wide spectrum of targets.

$5.0 million is requested in fiscal year 1982 for the initial procurement of material to support the fiscal year 1983 authorization request for 90 missiles at $33.2 million.

(VG-8)

HARM

HARM is a high speed, anti-radiation missile designed to destroy or suppress land or sea-based radars supporting enemy air defense systems. HARM performs this function by homing on and destroying the radars associated with enemy surface-to-air missiles and radar directed anti-aircraft guns. The current inventory of the anti-radiation missiles, SHRIKE and STANDARD ARM, were used extensively in the Southeast Asia and Mideast wars and proved their utility in both conflicts. However, the diversity of Soviet air defense systems today severely limits the operational effectiveness of both SHRIKE and STANDARD ARM. HARM will be deployed on the A-7E, F/A-18 and A-6E aircraft and will correct the operational deficiencies prevalent in SHRIKE through increased velocity, greater range, a low smoke motor, improved sensitivity, flexible logic for in flight retargeting and a broadband coverage in a single seeker head.

HARM provides the major ingredient in the Navy's lethal defense suppression capability which will permit the conduct of tactical air missions effectively with acceptable loss rates. In fiscal year 1982 authorization for 134 missiles at $107.6 million is requested. Authorization for 249 missiles at $151.1 million is requested for fiscal year 1983.

SURFACE-TO-AIR MISSILES

STANDARD MISSILES

The STANDARD Missile is the mainstay of the U.S. and allied Navy's surface to air anti-air warfare weapons. The missile has three principal versions: the RIM-66B STANDARD (SM-1) Medium Range (MR) Missile; the RIM-66C STANDARD (SM-2) Medium Range (MR) Missile; and the RIM-67B Extended Range (ER) Missiles. The STANDARD Missile is an evolutionary weapon which has been improved as required to meet current and future threats.

(VG-9) The STANDARD (SM-1) Medium Range (MR) Missile, is installed in guided missile cruisers, destroyers, and frigates; a total of 57 ships. Additionally, it is employed by six Allies in twenty ships. It is a supersonic, medium range missile which provides all-weather, surface-to-air and surface-to-surface weapon and which incorporates advanced solid state electronic and engineering concepts.

The STANDARD (SM-2) Medium Range (MR) missile provides enhanced performance over the SM-1(MR) version through incorporation of mid-course guidance capability and electronic counter countermeasures (ECCM) improvements which provide immunity to a broad scope of electronic jamming. The SM-2(MR) Missile will be fired from the AEGIS cruisers and eventually from some guided missile cruisers.

(VG-10) The STANDARD (SM-2) Extended Range (ER) Missile, SM-2(ER) essentially doubles the range and firepower of the SM-1(ER) version, which has been out of production since 1974, by use of mid-course guidance, an inertial reference system, and ECCM improvements which provide immunity to a broad range of electronic jamming. The SM-2(ER) will fill the range gap left by the phasing out of the TALOS Missile and is planned for installation on 31 cruisers and destroyers presently equipped with the Terrier missile system.

The fiscal year 1982 request for STANDARD MR, SM-1, is $164.8 million for 600 missiles. For STANDARD MR, SM-2, we are requesting $61.6 million for 120 missiles; and for STANDARD ER, SM-2, $215.0 million for 375 missiles, 35 of which are SM 2 block II pilot production units. In fiscal year 1983, we are requesting authorization to procure 650 STANDARD MR missiles, SM-1, at $181.4 million, 150 STANDARD MR missiles, SM-2 at $93.2 million, and 450 STANDARD ER missiles, SM-2, at $284.7 million.

OTHER MISSILE SUPPORT

The "Other Missile" fleet support item funds material for missiles already in fleet inventory -- TERRIER, TARTAR, and the submarine-launched SUBROC anti-submarine rocket. Material procured by these funds includes stands, containers, consumable test and training material, and replacement equipment for the service life extension of the SUBROC Missile. For fiscal year 1982, $3.8 million is requested. Authorization to expend $3.9 million is requested for fiscal year 1983.

(VG-11)

AERIAL TARGETS

The aerial target program provides training assets to establish and maintain the combat readiness required by Navy personnel in the use of air and surface to air missile and guns systems and for the testing of new weapons. These targets replicate a wide variety and range of threat missiles and aircraft. The aerial target inventory has great demands placed upon it, both in numbers and in sophistication required to simulate realistic enemy threat in support of fleet training. This requirement, coupled with inflationary factors, drives the cost of individual targets beyond that of the less complex ones of only a few years ago. Even so, aerial targets remain vitally important to training and fleet readiness. The fiscal year 1982 budget requests $67.9 million for these targets. The fiscal year 1983 request is for $53.5 million.

MISSILE MODIFICATIONS

Missile modifications are required to improve and update the performance and operational characteristics of missiles. There are two missile modification programs that I would like to emphasize. The first is a program to make block improvements to the HARPOON missile as it is procured in fiscal year 1981 and beyond and to retrofit already produced missiles during the periodic maintenance cycle. This block improvement program consists of minor changes to counter the emergent threat. The first of two block changes is "Block One B." [Deleted] [Deleted] The second block improvement, "Block One C" will provide improved electronic counter-counter measures. The second initiative is concerned with the SIDEWINDER air-to-air missile. The modification program is for a block improvement to upgrade the earlier variant AIM-9H. [Deleted]

The result is that the AIM-9H becomes an AIM-9M. These improvements are very low risk and provide the operational commander the flexibilty and versatility required to defeat the enemy. The fiscal year 1982 budget request for "Other Missile" modifications is $39.7 million. The fiscal year 1983 authorization request is for $89.5 million.

SUPPORT EQUIPMENT

Support equipment and facilities include initial and replenishment spare parts and the improvement of weapon industrial facilities. The fiscal year 1982 request for support equipment and facilities is $43.9 million. For fiscal year 1983, authorization for $73.5 million is requested for the Support Equipment line.

BUDGET ACTIVITY III

TORPEDOES AND RELATED EQUIPMENT

Budget Activity III funds for procurement of the submarine launched MK 48 torpedo, procurement of the MK-46 NEARTIP torpedo, and the MK-60 moored encapsulated torpedo anti-submarine mine (CAPTOR); and procurement of subsurface mobile targets, torpedo modifications, and support equipment (including related spare and repair parts). For the overall Budget Activity III, $516.6 million is requested for fiscal year 1982.

(VG-12)

MK 48 TORPEDO

The MK 48 Torpedo, which has been in production since 1972, is a submarine launched, acoustically guided dual-purpose antisubmarine and anti-surface ship weapon. This torpedo is the primary offensive and defensive tactical weapon for our attack submarines and is carried by strategic missile submarines as a self-defense weapon. Approximately 2600 MK 48's have been delivered to the Fleet and [deleted] more are in various stages of production and proofing. The fiscal year 1982 request is for $133.5 million for the procurement of 144 torpedo is requested.

(VG-13)

MK 46 TORPEDO

The Torpedo MK 46 Mod 5 Near Term Improvement Program (NEARTIP) is an improved version of the earlier generation Torpedo MK 46 Torpedo. It features an acoustic system and countermeasures resistance capability that significantly increases the performance of this in-service conventional lightweight torpedo designed for launch from surface vessels as well as fixed wing and rotary wing aircraft. Funding is requested for fiscal year 1982 for the procurement of 288 MK 46 NEARTIP torpedoes at $65.0 million. The fiscal year 1983 authorization requested is for 900 MK 46 NEARTIP torpedoes at $213.7 million.

TORPEDO MODIFICATIONS

The torpedo modification program is directed primarily to the production of Near Term Improvement Program (NEARTIP) modification kits which modify MK 46 Torpedoes Mods 1 and 2 to the more capable NEARTIP configuration, to the production of CAPTOR modification kits to enable the deployment of the MK-46 torpedo as the CAPTOR pay load; and to support the procurement of essential MK 48 Torpedo modifications which have been determined necessary to maintain the material reliability of the MK 48 Torpedo inventory and provide an interim capability against the Soviet high speed deep diving submarine and commencing in fiscal year 1983 initiation of procurement of the advance capability modification (ADCAP) to the MK-48 to counter the projected Soviet threat. $128.7 million is requested in fiscal year 1982 and $108.7 million is requested for authorization in fiscal year 1983.

(VG-14)

CAPTOR

The Encapsulated Torpedo (CAPTOR) is a moored, deep water, influence activated anti-submarine warfare mine which launches a modified MK-46 torpedo when a submerged submarine is detected by the mine. The Technical and Operational Evaluation (TECH/OPEVAL) for CAPTOR was completed in February 1975. Provisional Approval for Service Use was granted in January 1976. Production, with a rate of 10 units per month, commenced soon thereafter. Hardware reliability was emphasised and specifications for high reliability parts and additional quality assurance provision were included in the production program.

Follow-on Test and Evaluation (FOT&E) was conducted from January 1978 through October 1980. These most recent series of tests have demonstrated a successful modification to improve weapon performance under some operational conditions and increase the utility of the mine. Approval for service use was granted in February 1980. The fiscal year 1982 budget request is for $116.9 million for 400 CAPTORS. Authorization for 600 CAPTORS at $173.3 million is requested for fiscal year 1983.

(VG-15)

MK 30 MOBILE TARGET

The MK 30 Mobile Target provides submarine simulation for the support of comprehensive ASW exercises for aircraft, submarines and surface ships. The

Mobile Target MK 30 is a versatile and recoverable target which is used to provide anti-submarine warfare training and evaluation operations on instrumented three-dimensional underwater acoustic ranges. The major performance characteristics of the MK 30 Target are: simulation of dynamic maneuvers of modern submarines; response to active sonar and torpedo interrogations; generation of submarine-like radiated noise and magnetic anomaly; and the ability to be controlled by preprogrammed or acoustically transmitted instructions.

For fiscal year 1982 we are requesting $18.7 million for the production of seven targets, continuation of fleet support and for acceptance of production targets. For fiscal year 1983 we are requesting authorization for nine targets for $20.1 million.

(VG-16)

MK 38 MINI-MOBILE TARGET

The MK 38 Miniature Mobile Target (MMT) is a small, expendable hand-launched acoustic device developed as an open ocean ASW basic training target for surface ship hull mounted and towed array sonars, and the MK 46 Torpedo. It is small, easy to use and relatively inexpensive. The total request for MK 38 Mini-Mobile Target support in fiscal year 1982 is $700 thousand. In fiscal year 1983 we are requesting authorization for the procurement of 1200 targets for $2.4 million.

ANTI-SUBMARINE ROCKET

The Anti-Submarine Rocket (ASROC) is designed to carry either a MK-46 Torpedo or nuclear depth charge payload. This system is used against submarines by frigates, destroyers and cruisers. Funds are required to procure replacement components expended during ASROC exercise firings and for production support efforts. Funding of $3.9 million for fiscal year 1982 is requested. Authorization is requested to expend $9.2 million in fiscal year 1983 for ASROC.

SUBMARINE LAUNCHED MOBILE MINE

The Submarine Launched Mobile Mine is a modification to be MK 37 torpedo that provides the submarine with a standoff mining capability. $11.1 million is requested in fiscal year 1982 to modify 128 MK 37 torpedoes to a tactical mine configuration. In fiscal year 1983 authorization is request for $23.0 million to continue the modification program.

TORPEDO SUPPORT

The torpedo support category provides initial and replenishment spares to support both new and existing inventories of underwater ordnance, procures expendable support equipment needed to overhaul and reissue exercise weapons, and provides for the procurement of exercise range equipment. A total of $36.5 million is requested for this purpose in fiscal year 1982. For fiscal year 1983 authorization to expend $47.5 million is requested.

BUDGET ACTIVITY IV

OTHER WEAPONS

This budget activity provides for the procurement, modification and support of gun mounts. This activity contains such programs as the MK 15 PHALANX Close-In Weapon System and the MK 75 76MM Gun Mount.

Funds for modifications to existing 5"/54, 76 MM, 3"/50 guns and various other fleet machine guns, and small arms together with gun support equipment and spare and repair parts are also included. For fiscal year 1982, $200.2 million is requested for overall Budget Activity IV.

(VG-17)

PHALANX CLOSE-IN WEAPONS SYSTEM

Fiscal year 1982 represents the fifth year of procurement of the PHALANX Close-In-Weapon System (CIWS). CIWS will be installed on a wide variety of surface ships and will provide a high confidence, terminal defense system that will allow fully automatic detection, track, and kill of low-flying anti-ship missiles or aircraft that may penetrate fleet area defense.

CIWS has undergone one of the most extensive and rigorous testing programs ever conducted by the Navy. System requirements have been met or exceeded. During the OPEVAL in 1977 Navy Petty Officers, without external assistance, maintained CIWS for two months - reliability greatly exceeded the requirement and maintainability met the requirement. Based on these results, the Chief of Naval Operations granted Approval for Service Use in 1977. There are three ships at sea now, with eight system installed. By the end of fiscal year 1981 there will be eight ships with eighteen systems installed and eighteen additional ships with thirty-one systems under going installation. Authorization for 50 systems for $134.7 million in fiscal year 1982 is requested. In fiscal year 1983 $140.3 million for 50 systems is being requested.

(VG-18)

MK 75 76MM GUNS

The MK 75 76MM Gun Mount, designed by Oto Melara of Italy, is a minor caliber, dual purpose, high rate-of-fire gun. It is funded under the Weapons Procurement, Navy appropriation for installation in WMEC-270 Coast Guard Cutters. The mount has been operationally tested, and Provisional Approval for Service Use was granted in September 1975. In fiscal year 1982, $4.5 million is requested for procurement [deleted].

MODIFICATION OF GUNS AND GUN MOUNTS

The fiscal year 1982 request includes $27.3 million for an ongoing gun mount product improvement program. $19.3 million of the funds provide for ordnance alterations (ORDALTS) for CIWS installation and gun barrel improvement for various models of the MK 42 and MK 45 5"/54 mounts, as well as the continued production of the loader select modification kits. $7.4 million provides for the procurement of ORDALTS for 3"/50 and 76mm gun mounts and for a variety of minor caliber ordnance alterations. In fiscal year 1983 $40.2 million is requested for gun mount modifications.

SUPPORT EQUIPMENT

A total of $34.3 million is requested in fiscal year 1982 for support equipment, and spare and repair parts. These programs are of a continuous nature and the level of effort involved is generally determined by the principal weapon lines. Authorization for $43.1 million is requested for support equipment in fiscal year 1983.

Mr. Chairman, I would like at this juncture to portray this budget request in a different perspective and that is from the shipboard operating force commander's point of view. What will these procurements of tactical weapons contribute to achieving inventory objective or to achieving shipfills or air wing/squadron fills.

In summarizing the programs of surface-to-surface, air-launched, ship launched and anti-submarine weapons, it is appropriate to put the fiscal year 1982 procurement profile into perspective. The delivery of munitions authorized and appropriated for fiscal year 1982 will not be completed until the end of the funded delivery period (FDP) that is during fiscal year 1984. The period of time required for contracting, material procurement, manufacturing and delivery for items in this budget request will require approximately twenty-four months.

The first type of munitions is surface-to-surface consisting of TOMAHAWK and HARPOON missiles.

SURFACE TO SURFACE MUNITIONS

WEAPON	INVENTORY OBJECTIVE	JAN 81 INVENTORY	% I.O.	FY 1982 PROCUREMENT	PROJECTED INVENTORY END OF FY82 FDP	PERCENT OF IO
TOMAHAWK	[Deleted]			88	[Deleted]	
HARPOON				340		

While this fiscal year's procurement of Tomahawk only contributes [Deleted] [Deleted] it is a reasonable and prudent plan for a weapon that is in its early years of procurement. By the end of the FYDP the inventory will rapidly grow [Deleted] and this will contribute signficantly to filling the launching systems projected to be available at that time.

HARPOON procurement contribution is [Deleted] During the FYDP the procurement quantities are programmed to increase such that by the end of the 1986 FDP the inventory is projected [Deleted]

The second munition type is air-launched missiles.

AIR-LAUNCHED MUNITIONS

WEAPON	INVENTORY OBJECTIVE	JAN 81 INVENTORY	% IO	FY 1982 PROCUREMENT	PROJECTED INVENTORY END OF FY82 FDP	PERCENT OF IO
AIR SPARROW	[Deleted]			475	[Deleted]	
SIDEWINDER				910		
PHOENIX				72		
HARM				134		

Air Sparrow and Sidewinder procurement make satisfactory contributions. The contribution of this fiscal year's procurement to the Phoenix inventory objective is at a reasonable rate when consideration is given to the evolution from the A to C variant. HARM [Deleted] will rapidly improve through the FDP with a higher production rate by the prime contractor and certifying a second source.

The next munitions type is surface to air AAW missiles.

SURFACE LAUNCHED MISSILES

WEAPON	INVENTORY OBJECTIVE	JAN 81 INVENTORY	% IO	FY 1982 PROCUREMENT	PROJECTED INVENTORY END OF FY82 FDP	PERCENT OF IO
SEA SPARROW	[Deleted]			430	[Deleted]	
STANDARD MSL						
MEDIUM RANGE				720		
EXTENDED RANGE				375		

Sea Sparrow will have an excellent inventory by the end of the FYDP funded delivery period and have sufficient missiles to fill ship needs by the end of fiscal year 1986. Standard missile growth [Deleted] from the point of view of the fiscal year 1982 procurement. The projected percentage of inventory objective for both the medium and extended range missiles at the end of the FYDP funded delivery period [Deleted] These missiles will be procured [D [Deleted] starting in fiscal year 1984.

The final munition type is anti-submarine warfare.

ASW MUNITIONS

WEAPON	INVENTORY OBJECTIVE	JAN 81 INVENTORY	% IO	FY 1982 PROCUREMENT	PROJECTED INVENTORY END OF FY82 FDP	PERCENT OF IO
MK-48*	[Deleted]			144	[Deleted]	
MK-46				1160		
CAPTOR				400		

* Includes MOD kits.

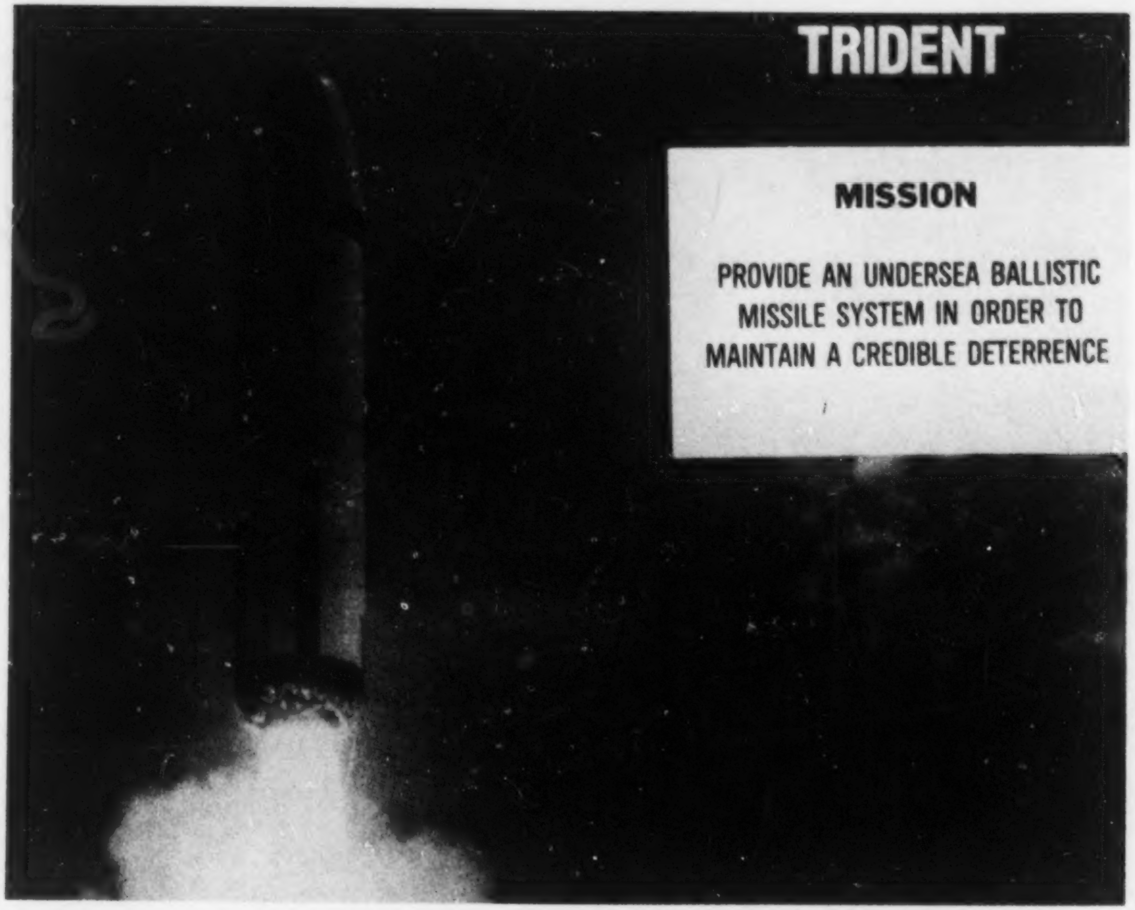
The MK-48 procurement help to develops a better reload capability and allows for peacetime consumption of [Deleted] weapons [Deleted] during the life of the weapon. The MK-46 situation is an [Deleted] the fiscal year 1981 procurement and will bring our ship fills and aircraft requirements up [Deleted] [Deleted]. The procurement for CAPTOR in fiscal 1982 builds up the production rate [Deleted] from the minimum sustaining rate. In fiscal year 1983 this weapons procurement will be [Deleted] [Deleted] allowing achievement of inventory objective [Deleted].

As emphasized earlier the changing nature of the parameters of the requirements model necessitate a continuing review by Navy. Not only are the standard factors reviewed but new consideration such as contingency overlap of targets, strategic reserve, industrial preparedness and countermeasure employment are under study. Other aspects under review are the mix and quantity of each variant within a generic type, eg TOMAHAWK anti-ship and land attack. While this effort is internal to Navy liaison with the Office of the Secretary of Defense is ongoing. Threat oriented weapon inventory objectives under study by Navy for future use are of the order of magnitude illustrated below:

SURFACE TO SURFACE MISSILES	[Deleted]
TOMAHAWK (anti-ship and land attack)	
HARPOON	
AIR LAUNCHED MISSILES	
AIR SPARROW	
SIDEWINDER	
PHOENIX	
SURFACE LAUNCHED MISSILES	
STANDARD MISSILE	
MEDIUM RANGE	
EXTENDED RANGE	
SEA SPARROW	
ASW MUNITIONS	
MK-48 TORPEDO	
MK-46 MOD 5 TORPEDO	

Within the Weapons Procurement, Navy there are initiatives underway to increase production efficiency as we increase numbers of weapons procured. Second source qualification efforts are being pursued for the Sidewinder, Sparrow and Harm missiles. Upon qualification competitive contracting will be utilized. However, the method by which the Services currently do business, one year at a time, could be significantly improved if authority to enter into multi-year contracts was granted. This year by year basis is dictated by the annual budget and appropriation process. The lack of long term government commitments discourages industry from investing to achieve economical production runs. Year to year contracting offers little inducement to invest now for achieving economics in future production years with subsequent savings to the government. Multi-year contracts would replace the uncertainty about future buys, should prompt producers to stockpile needed materials, encourage investment in tooling and facilitate efficient scheduling by prime contractors and their all important sub-contractors. The Services and the Office of the Secretary of Defense are now working to nominate suitable weapons as viable multi-year procurements. These actions are in agreement with the findings and recommendations of the Report of the Defense Industrial Base Panel of the Committee on Armed Services, House of Representatives, Ninety-Sixth Congress, on The Ailing Defense Industrial Base: Unready for Crises and I urge you to act on the proposed amendment to Title 10, U.S. Code, H. R. 745.

Mr. Chairman, that completes my statement of the fiscal year 1982 Budget Request as amended for the Weapons Procurement, Navy, Appropriation. I would be happy to answer any questions you or the members of the subcommittee might have.



TRIDENT

MISSION

PROVIDE AN UNDERSEA BALLISTIC
MISSILE SYSTEM IN ORDER TO
MAINTAIN A CREDIBLE DETERRENCE

TOMAHAWK

MISSION

PROVIDE A LONG RANGE CRUISE MISSILE LAUNCHED FROM A VARIETY OF PLATFORMS AGAINST LAND AND SEA TARGETS

HARPOON

MISSION

PROVIDE AN ANTI-SHIP CRUISE MISSILE LAUNCH FROM A VARIETY OF PLATFORMS AGAINST SURFACE COMBATANTS, SURFACED SUBMARINES, AND ENEMY SHIPPING

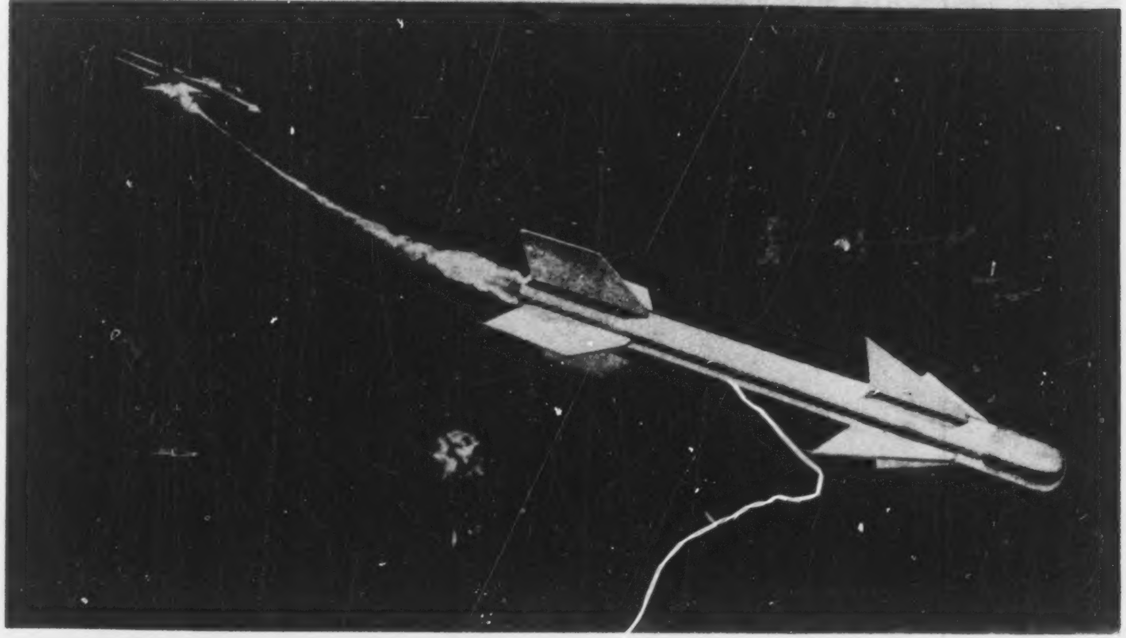
VC-3

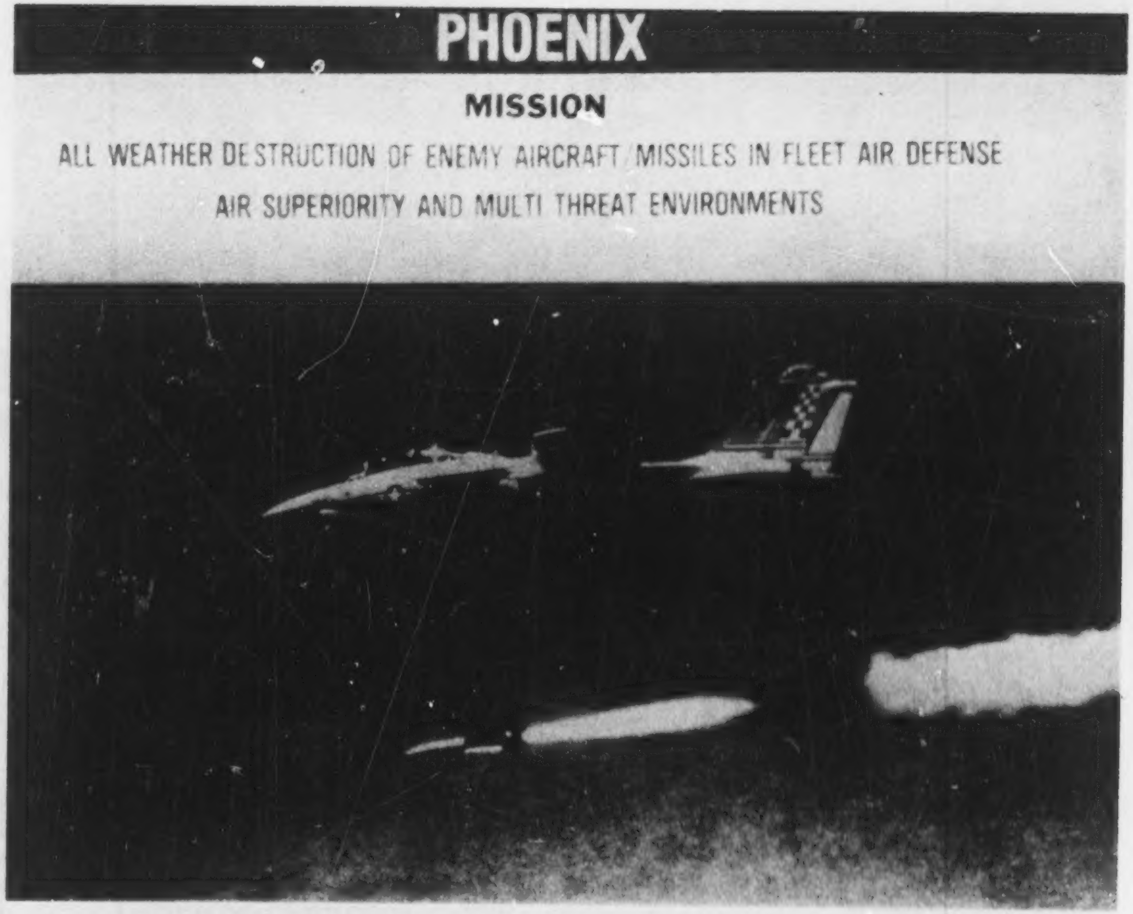
VG-4

SIDEWINDER

MISSION

SHORT RANGE INFRA-RED HOMING AIR-TO-AIR MISSILE DESIGNED FOR AIR-TO-AIR COMBAT IN VISUAL ENCOUNTERS





PHOENIX

MISSION

ALL WEATHER DESTRUCTION OF ENEMY AIRCRAFT/MISSILES IN FLEET AIR DEFENSE

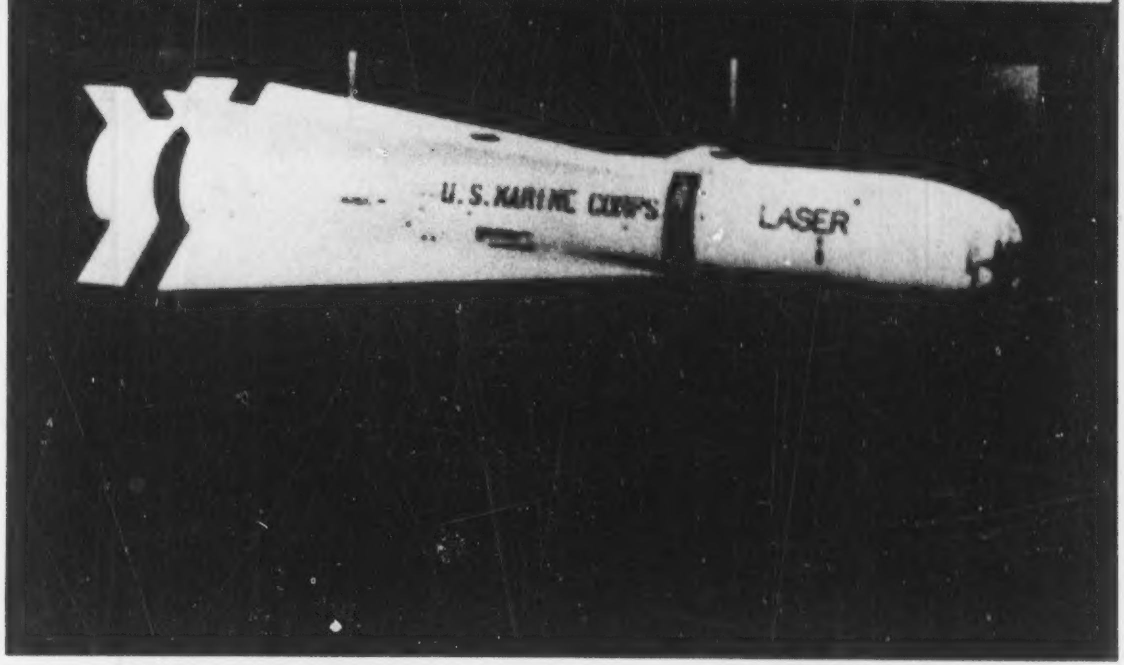
AIR SUPERIORITY AND MULTI THREAT ENVIRONMENTS

VG-6

LASER MAVERICK

MISSION

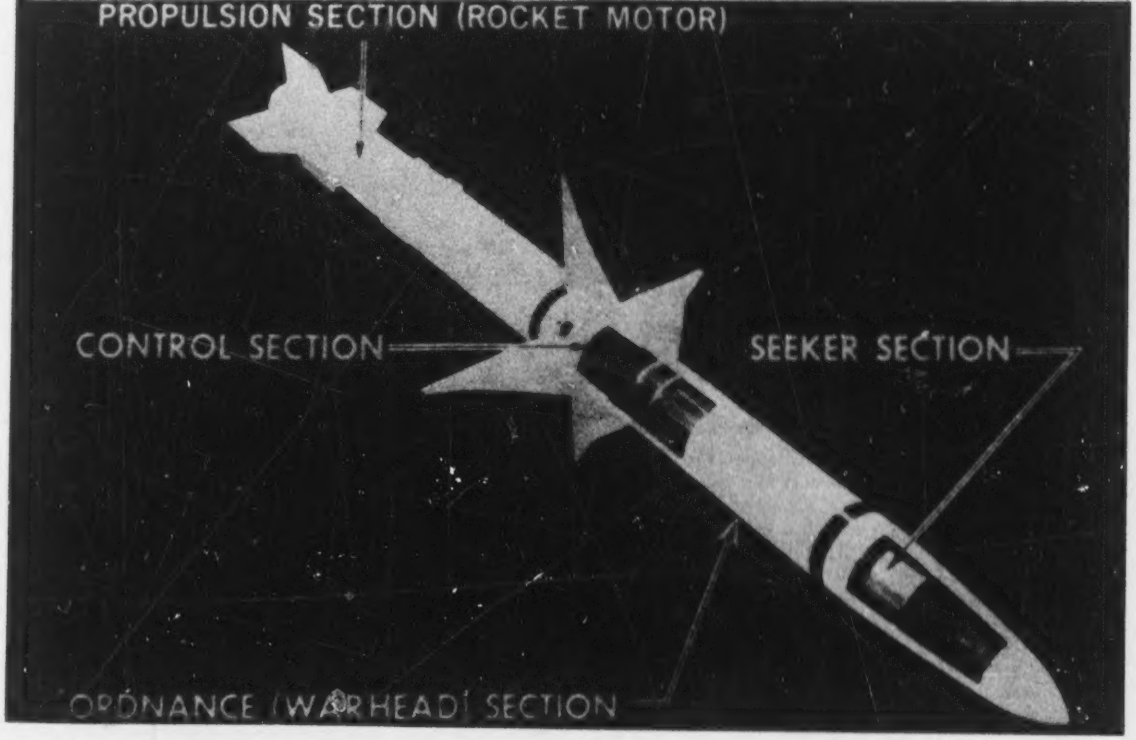
PROVIDE A LASER GUIDE AIR TO SURFACE WEAPON FOR USE IN CLOSE AIR SUPPORT AND BATTLE FIELD INTERDICTION


U.S. MARINE CORPS
LASER

HARM

MISSION

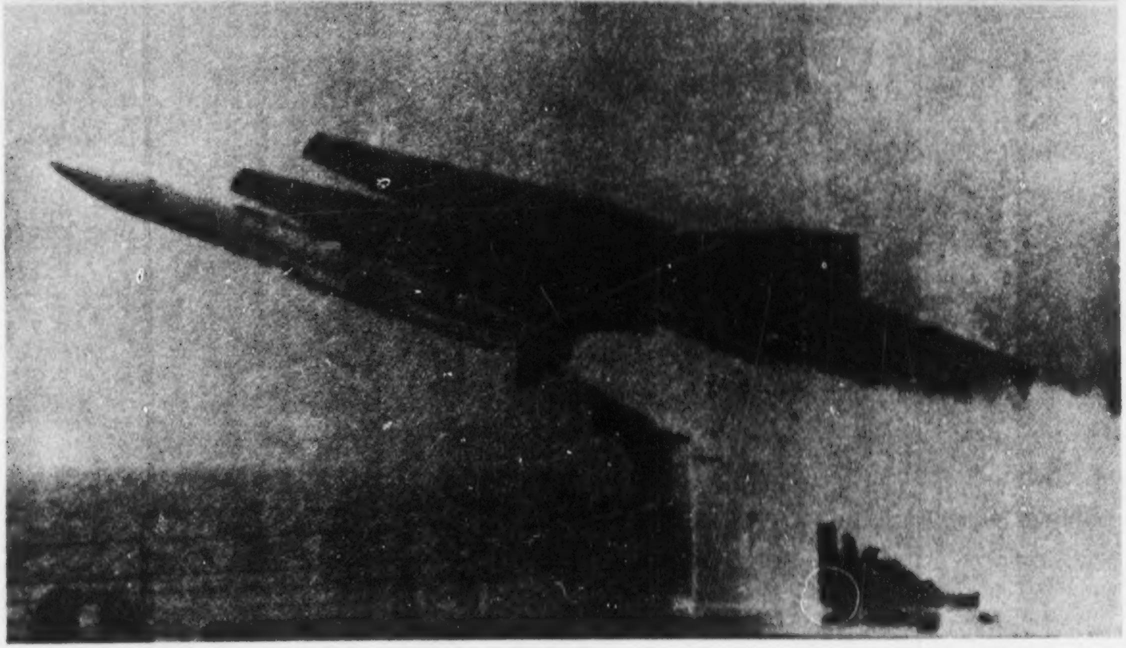
DESTROY/SUPPRESS ENEMY LAND AND SEABASED RADAR


PROPULSION SECTION (ROCKET MOTOR)
CONTROL SECTION
SEEKER SECTION
ORDNANCE (WARHEAD) SECTION

STANDARD MISSILE-MR

MISSION

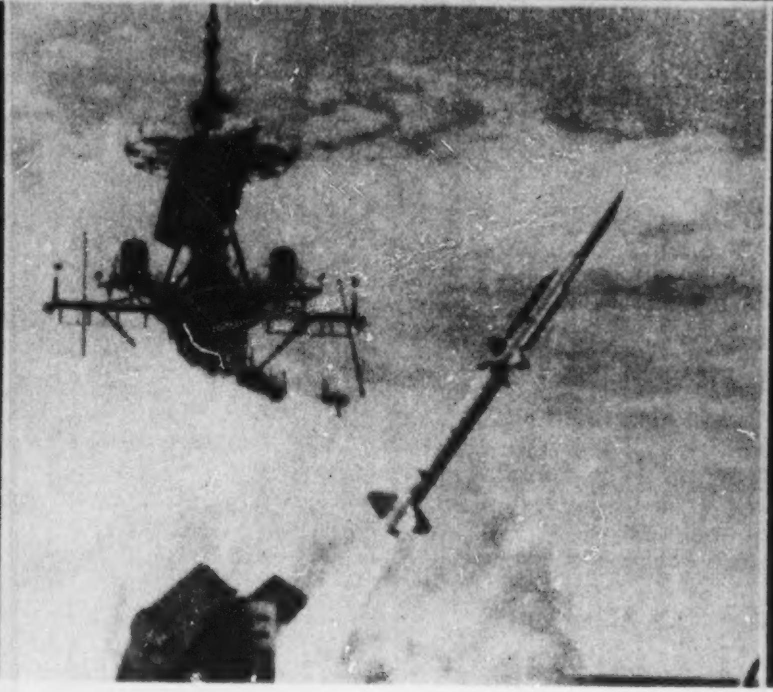
SURFACE TO AIR MISSLE SYSTEM WITH A LOW ALTITUDE CAPABILITY AGAINST HIGH PERFORMANCE AIRCRAFT, INSTALLED AS PRIMARY ANTI-AIRCRAFT BATTERY ON DESTROYERS, AS SECONDARY BATTERY ON HEAVY CRUSERS



STANDARD MISSLE-ER

MISSION

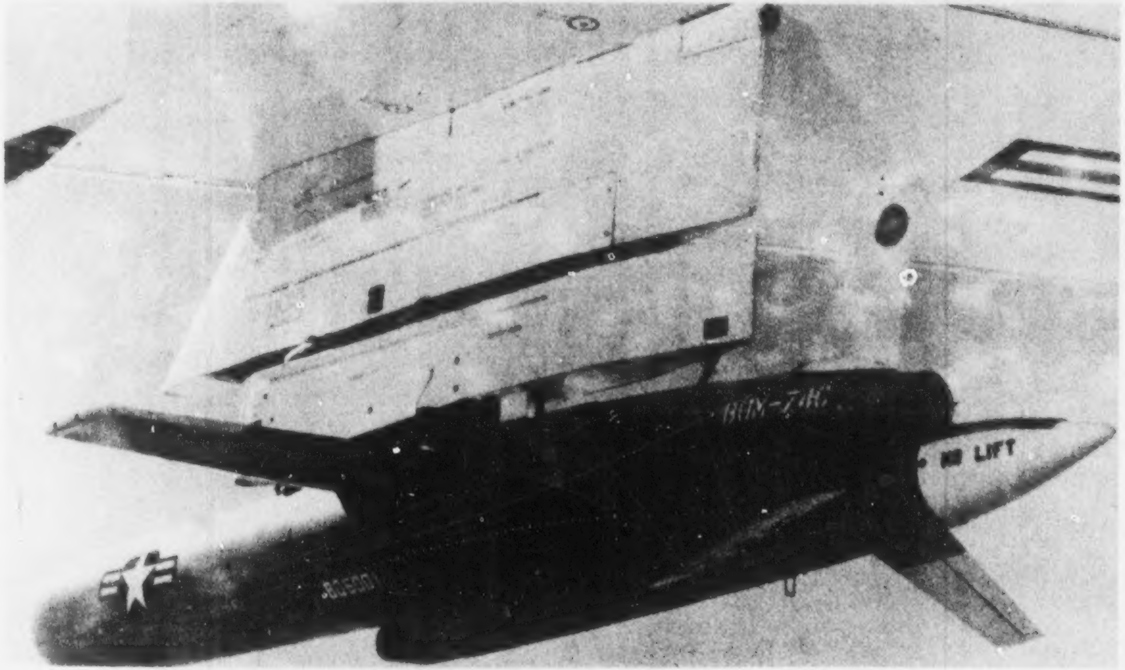
ANT-AIRCRAFT, SURFACE-TO-AIR GUIDED MISSILE INSALLED AS PRIMARY ANTI-AIRCRAFT BATTERY IN CRUISERS AND DESTROYERS



AERIAL TARGETS

MISSION

PROVIDE REALISTIC REPRESENTATIONS OF POTENTIAL THREATS TO FURNISH TRAINING FOR PERSONNEL IN THE USE OF MISSILES AND ANTI-AIRCRAFT GUN SYSTEMS



MK 48 TORPEDO

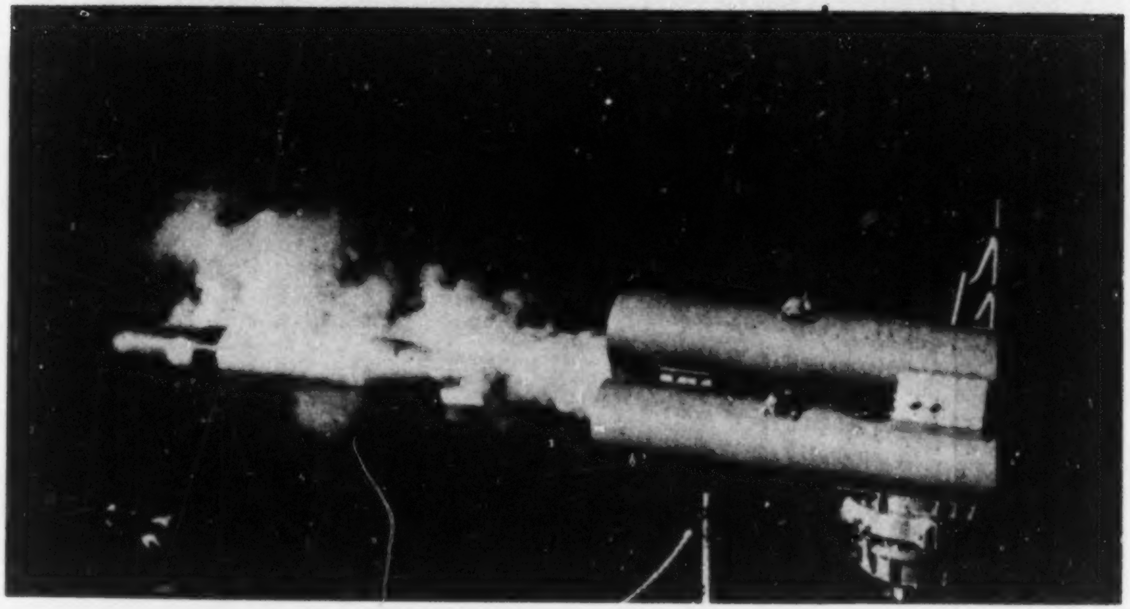
MISSION

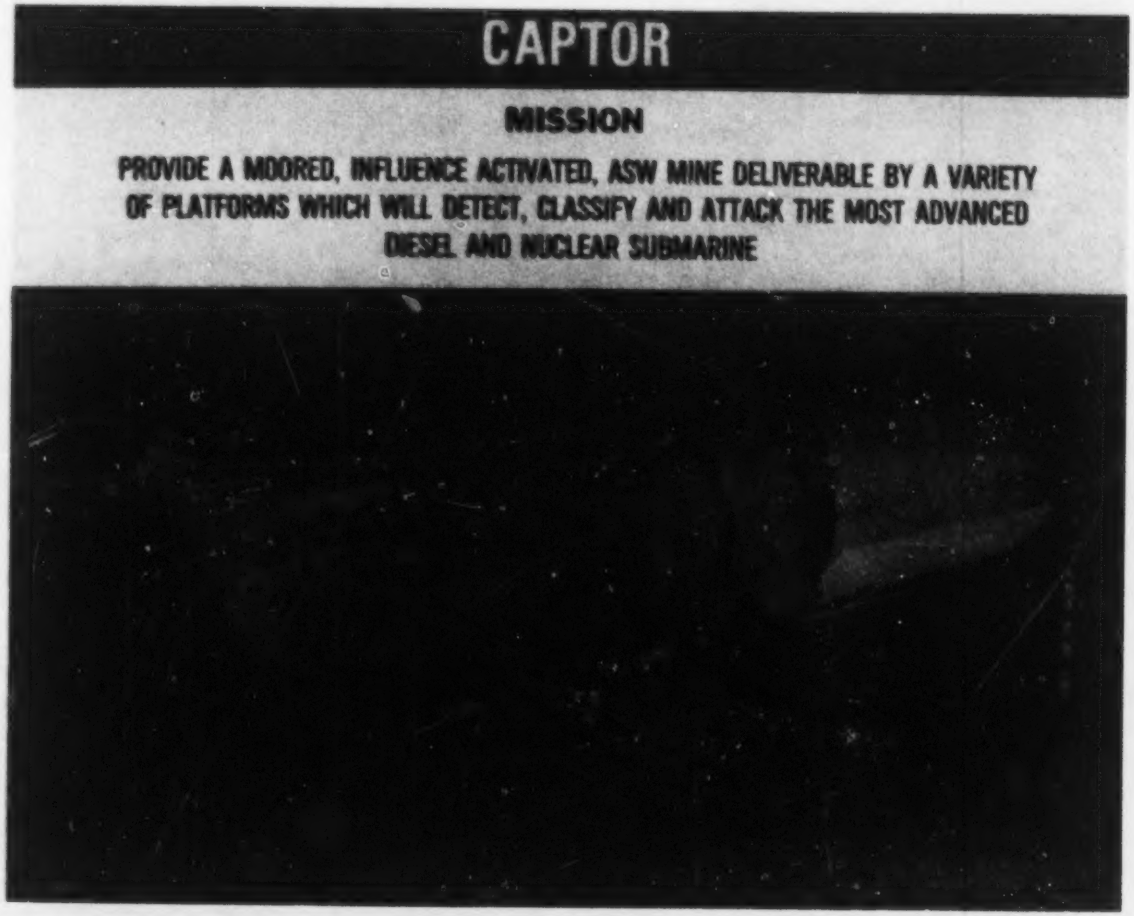
PROVIDE A SUBMARINE LAUNCHED HIGH SPEED ACOUSTIC TORPEDO WHICH IS EFFECTIVE AGAINST FAST DEEP DIVING, HIGH PERFORMANCE SUBMARINES AND SURFACE SHIPS OF ALL TYPES

MK-46 (NEARTIP)

MISSION

PROVIDE AN IMPROVED IN-SERVICE CONVENTIONAL LIGHTWEIGHT TORPEDO DESIGNED FOR LAUNCHING FROM SURFACE SHIPS, FIXED WING AND ROTARY WING AIRCRAFT TO BE EMPLOYED AGAINST THE MOST ADVANCED ENEMY SUBMARINE





CAPTOR

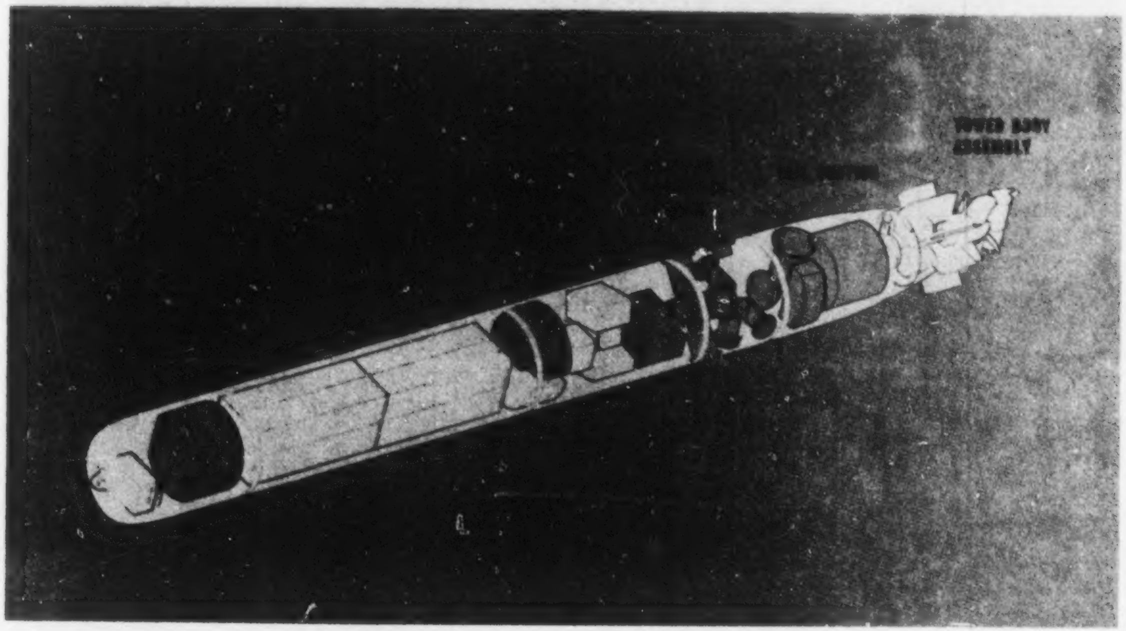
MISSION

PROVIDE A MOORED, INFLUENCE ACTIVATED, ASW MINE DELIVERABLE BY A VARIETY OF PLATFORMS WHICH WILL DETECT, CLASSIFY AND ATTACK THE MOST ADVANCED DIESEL AND NUCLEAR SUBMARINE

MOBILE TARGET MK 30

MISSION

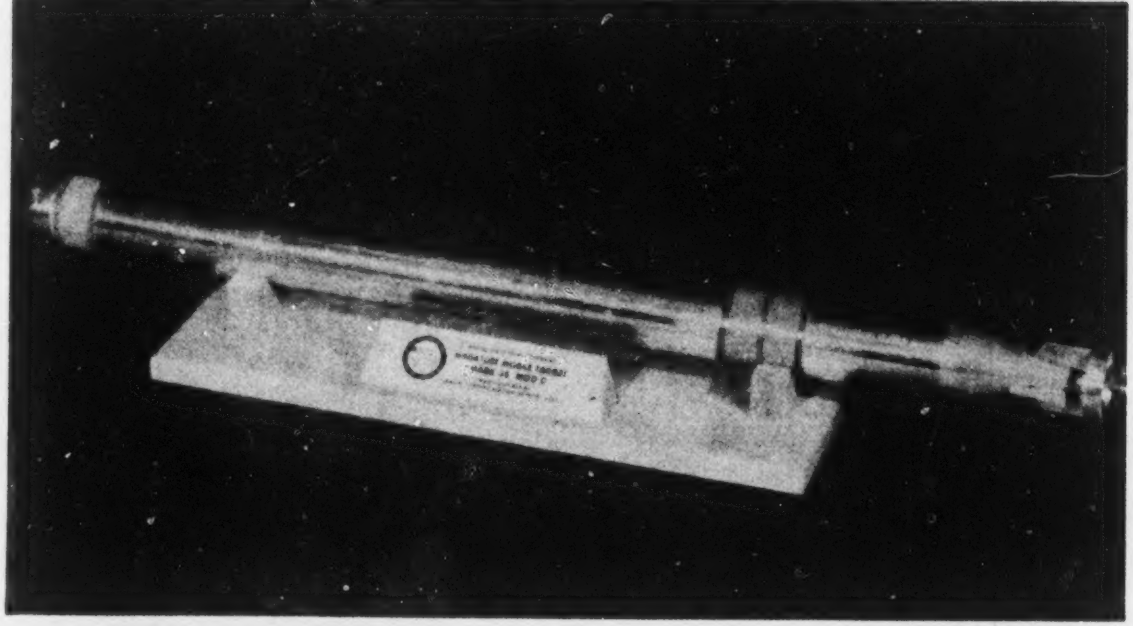
PROVIDE A MOBILE ASW TARGET FOR REALISTIC TRAINING WITH THE CAPABILITY TO EXERCISE TORPEDOS, EXISTING SONARS, SONOBUOYS AND MAGNETIC ANOMALY DETECTION EQUIPMENTS

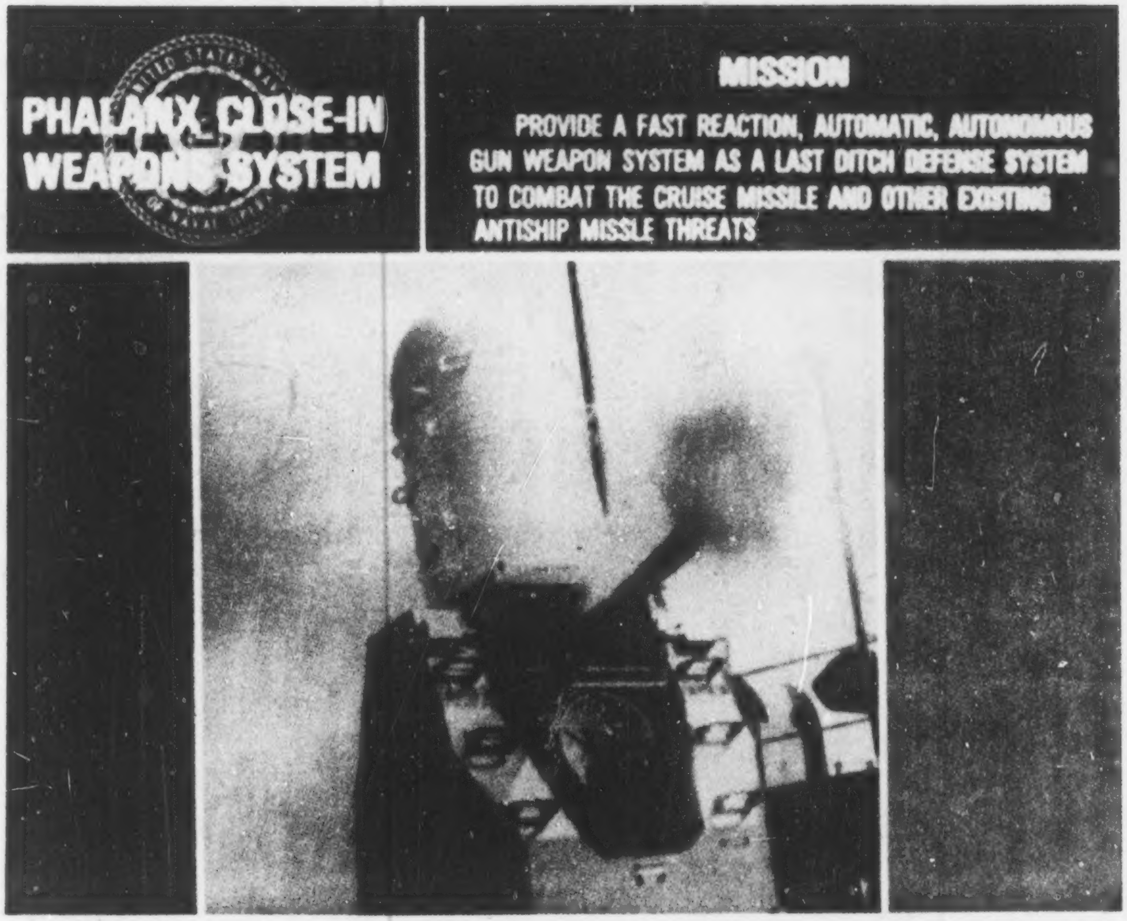


MINI MOBILE TARGET (MK 38)

MISSION

PROVIDE A SMALL HAND LAUNCHED EXPENDABLE ACOUSTIC DEVICE AS AN OPEN OCEAN TRAINING SYSTEM FOR SURFACE SHIP SONARS AND TORPEDOES

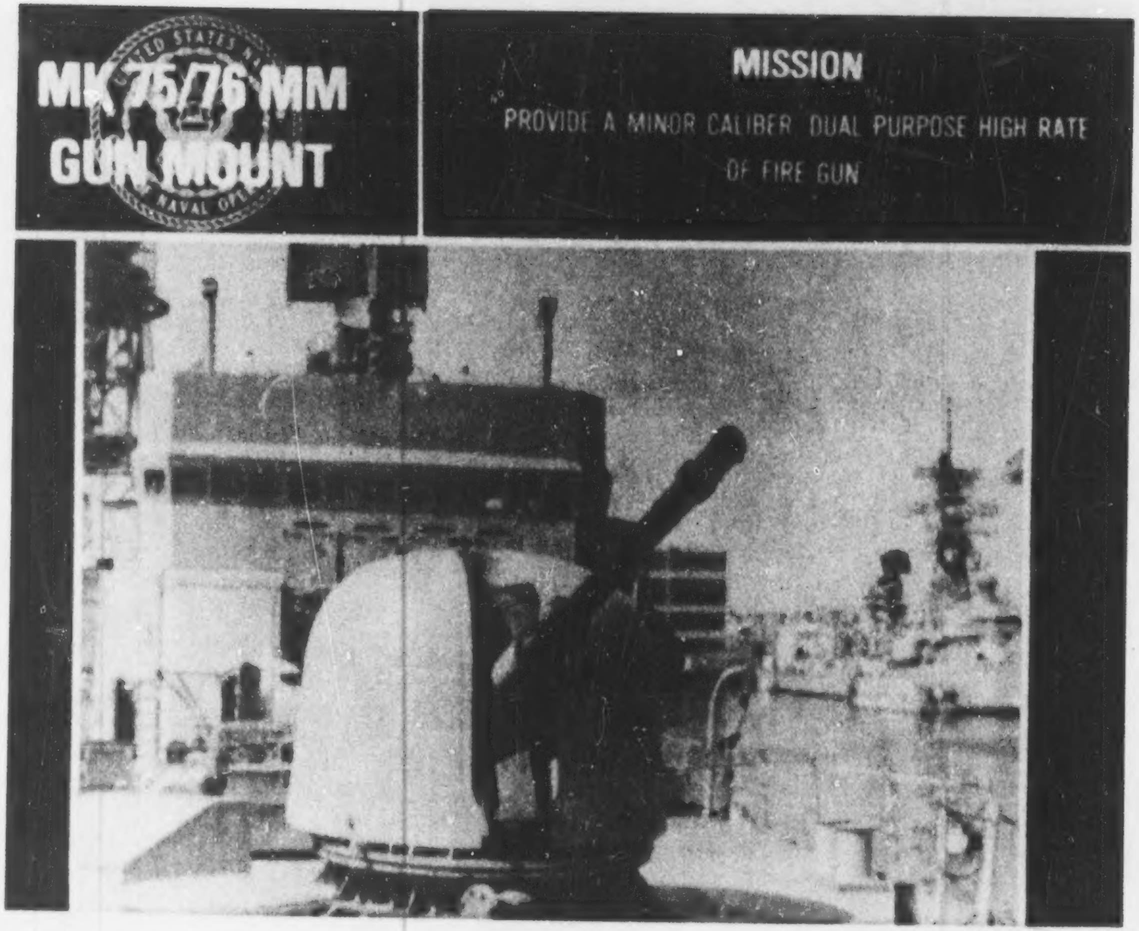




PHALANX CLOSE-IN WEAPONS SYSTEM

MISSION

PROVIDE A FAST REACTION, AUTOMATIC, AUTONOMOUS GUN WEAPON SYSTEM AS A LAST DITCH DEFENSE SYSTEM TO COMBAT THE CRUISE MISSILE AND OTHER EXISTING ANTISHIP MISSLE THREATS



MK 75/76 MM GUN MOUNT

MISSION

PROVIDE A MINOR CALIBER DUAL PURPOSE HIGH RATE OF FIRE GUN

VG-18

SUBCOMMITTEE RECESS

[Whereupon, at 9:58 a.m., the subcommittee recessed in executive session to go into open session.]

Senator **Rudman**. I want to thank all of you for being here this morning. I have learned a great deal from your testimony which is really the purpose of the hearingns.

We are going to reconvene today at 11 o'clock in room 424 of the Russell Building when Senator Weicker is going to receive testimony regarding the Naval submarine shipbuilding programs.

At the conclusion of that hearing the committee will stand in recess until Tuesday, the 21st when we will meet to consider the fiscal year 1982 Navy "Other procurement," Marine Corps "Procurement" and Navy and Marine Corps "Operating and maintenance" requests.

Gentlemen, thank you very much.

[Whereupon, 10:02 a.m., Thursday, April 9, the subcommittee was recessed to reconvene at 9 a.m., Tuesday, April 21.]

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1982

THURSDAY, APRIL 30, 1981

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, D.C.

The subcommittee met at 8 a.m., in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, Andrews, Rudman, and Stennis.

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE NAVY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

STATEMENT OF GERALD A. CANN, ACTING ASSISTANT SECRETARY OF THE NAVY (RESEARCH, ENGINEERING AND SYSTEMS)

ACCOMPANIED BY:
- VICE ADM. ROBERT R. MONROE, USN, DIRECTOR, RESEARCH, DEVELOPMENT, TEST AND EVALUATION
- VICE ADM. E. R. SEYMOUR, USN, COMMANDER, NAVAL AIR SYSTEMS COMMAND
- REAR ADM. RICHARD A. MILLER, USN, DIRECTOR, BUDGETS AND REPORTS, OFFICE OF THE COMPTROLLER
- BRIG. GEN. JACOB W. MOORE, USMC, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND STUDIES, HEADQUARTERS, U.S. MARINE CORPS
- WILLIAM A. MC MILLAN, SPECIAL ASSISTANT FOR CONGRESSIONAL COORDINATION TO THE DIRECTOR, R.D.T. & E., OFFICE OF THE CHIEF OF NAVAL OPERATIONS

INTRODUCTION OF WITNESSES

Senator STEVENS. The subcommittee will come to order.

We are here this morning to receive testimony on the Department of the Navy research and development request for fiscal year 1982 and the supplemental request for fiscal year 1981.

We are pleased to have with us today Mr. Gerald A. Cann, Acting Assistant Secretary of the Navy for Research, Engineering and Systems; Vice Adm. Robert R. Monroe; Brig. Gen. Jacob W. Moore; and Rear Adm. Richard A. Miller.

The fiscal year 1982 Navy R.D.T. & E. budget request is for $6.083 billion. This represents a net increase of $1.041 billion over the fiscal year 1981 request.

It may be necessary to close the hearing today due to classification of materials to be covered. In that event, if the members of the subcommittee or witnesses will inciate their desire to close the hearing, I will set a time for going into closed session. Most likely this would be for the period when a majority of members will be present. If this is the case, those individuals not cleared or not having the need to know will be required to leave.

Gentlemen, you may submit your detailed statements for the record and summarize your oral statements.

We are pleased to have you here this morning, and you may proceed as you desire, sir, with your statements.

BUDGET BREAKDOWN

Mr. CANN. I would like to take a few minutes to summarize some of the high points of the R. & D. budget. I have submitted my posture statement for the record and General Moore has submitted his posture statement for the Marine Corps.

What I would like to do is briefly review some of the key points.

I would like to first discuss how the budget is broken down, because I think it is important to be able to discuss the budget in this frame of reference:

The overall budget as shown in that left circle on the chart is $6 billion-plus, as we indicated. Generally it is broken up into a number of major categories. As you can see, the largest one is in the tactical warfare area, some $3.71 billion.

What I would like to do is highlight for you where that money, which is 60 percent of the total, goes.

If you look at the right-hand side, you will find that $2.18 billion of that is under naval, which I will discuss in a minute; and a small fraction is in theater nuclear, $142 million; and a little over $½ billion in C^3; we have $26 million in mobility; and $75 million in land efforts; and air has $780 million.

Under the naval area, which again is roughly 60 percent of the tactical budget, we have this broken down into areas that are perhaps more familiar, like anti-air warfare, AAW, which is $336 million; antisubmarine warfare, which is $757 million. Those are the two largest; and then we have large efforts in naval ships, $632 million. The largest increment in that area is major surface combatant, $122 million, which is nominally the DDGX, and we have others, as indicated.

That is the general character of the R. & D. budget. I will submit this chart for the record also.

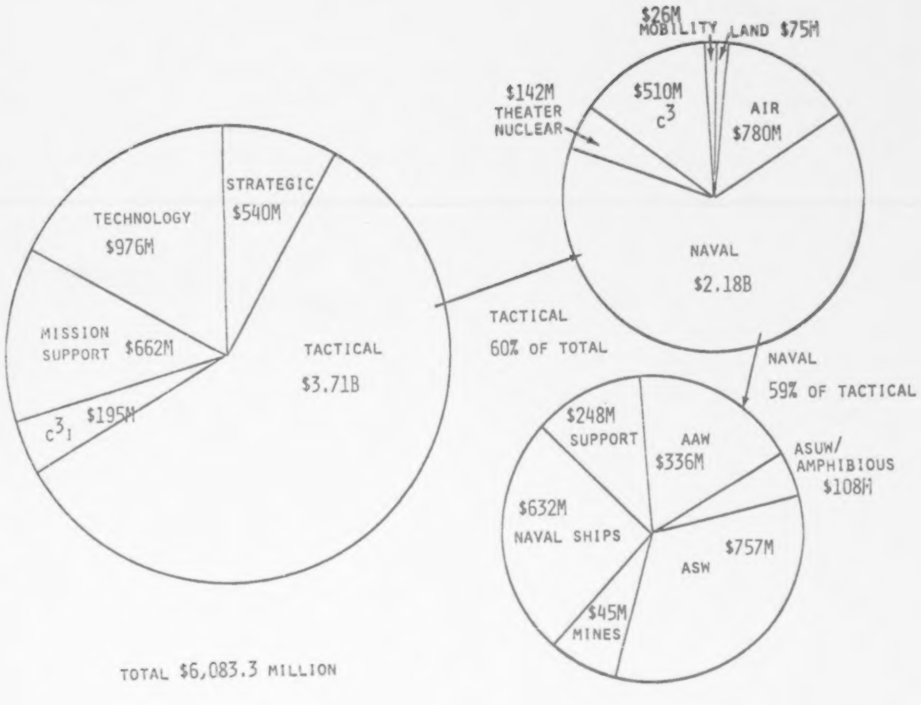


CHART 1

REESTABLISHMENT OF U.S. NAVAL SUPERIORITY

Mr. CANN. We are trying to support the Secretary of the Navy's priorities to establish and manage a shipbuilding and modernization program to regain naval superiority; and at the same time we are trying to reform the R. &. D. and procurement systems and shorten the acquisition cycle.

In order to improve our overall research and development and acquisition process, we have been concentrating on trying to bring forward R. & D. programs in an evolutionary fashion. By that I mean that instead of always going to something brand new, we are going to take advantage of the revolutionary nature of the digital electronics world to package into existing systems more capability and update them, as opposed to completely new systems.

Good examples of this are the Mark 48 torpedo, the Phoenix AIM 54 missile, the Mark 46 torpedo and a number of other programs. Of course, we will have a number of new systems that will take advantage of new technology, such as the Tomahawk, the HARM missiles, and the ASW stand-off weapon.

LAND-BASED TEST SITES

Another important thrust to improve our entire acquisition process is to have land-based test sites. We have demonstrated over the last few years that where we have a land-based test site to fully integrate and test the total system it has a greater potential for success when you enter the new system into the fleet. The Aegis system, which will be coming into the fleet in the next few years, is a good example of that.

We have a complete Aegis weapon-systems development site up at Mooreston, N.J., and the FFG-7's have had a very successful entry into the fleet based on their land-based test site. LAMPS III also has had a successful land-based test site, and we propose to do this in new programs also.

In order to enhance this whole evolutionary process we are working hard on modularity and standardization. We have worked hard on the standardization issue and as an example of that we have the advanced signal processor which is used in ASW. If you were to have time to examine it, you would find that it is a standard unit in the FFG's and many other weapon systems. We are going to have a standardized set of equipment.

ACQUISITION PROCESS

Let me just touch briefly on the acquisition process.

The new Secretary of Defense initiated a review of the entire process, the planning and budget system and the DSARC acquisition policy. There has been general agreement on the need to reduce the total acquisition time.

I would like to draw your attention to a couple of very important issues:

As a result of this review, it has been pretty well decided that we will end up with only two major milestones in the formal process, but in order to reduce the total acquisition time, perhaps by as much as 2 years, we feel it is important to improve the transition to production.

Currently what we have had to do is finish R. & D. before we can start production. That has several drawbacks. One of the drawbacks is that you are testing hardware in many cases and it does not really look like the production hardware.

We would propose that in full-scale development we start pilot production, very limited production, but those units and articles should look very much like the final production equipment and should use hard tooling and should be used for testing. By starting at this point in time, in a control sense you are in a much better position to go to full production, and we probably will be able to do it from 2 to 3 years earlier.

This will be one of the main thrusts that you will see suggested by the Secretary of Defense.

REDUNDANCY IN RESEARCH AND DEVELOPMENT

Senator **Stevens**. As long as someone is going to make the decision on which of these redundant systems we are going to concentrate on for the future. We have the impression, right or wrong, that there are a series of initiatives of new systems and that they are all being brought forward at the same time. No one seems to have the courage to decide which one is the best and to go ahead with it. We have these competing, redundant systems and they all go forward and continue to go forward until someone says it is absolutely not going to work, rather than "this is the one that will work" or "these two," or whatever you decide you need in terms of numbers. But there seems to be a plethora of new systems that are redundant.

This idea of this pilot production, when is going to be the decision time as to whether this system or this weapon is going to be one that we are going to take on all the way?

Mr. CANN. The systems being proposed for R. & D., at a point in time which I would judge to be just before we come to Milestone I, will be based on a need requirement. That need requirement will evaluate whether or not what will be developed is a system that replaces an existing system or is it an entirely new capability. That decision will be made according to discussions we have been having with Dr. DeLaver very early in the decision process.

DECISION ON WHEN TO TERMINATE R. & D. PROGRAM

Senator STEVENS. I think we should get an idea that we are not going to see the continuation of these items, and there has been no decision that it is absolutely necessary to continue in total production. Somewhere, someone has to cut these off.

Senator Rudman and I were talking about it the other night, and we have a definite impression from the briefings so far that this has to be stopped. I think we ought to go into some specifics, but we don't want to call you back and go into some specifics and say, "When is the decision going to be made as to whether this is going to be totally developed, totally introduced, or stopped?"

Mr. CANN. Under the present DSARC concept, this decision is made at Milestone II, which is the entry into full-scale development. The major review at that point is one that determines whether or not the system will really go into full-scale development and be carried forward into production.

Under the system being proposed by Dr. DeLaver, there will be a second milestone which will take place a little bit later than what we now call Milestone II, which is at the very beginning of full-scale development. They want to select a point which is called critical design review. It is before you start to commit any major money to hardware. It is after the design of a given system has been reduced to the point where you have a very clear understanding of the details, and you can cost in some detail.

That is in more detail than we are able to cost programs now at the beginning of full-scale development. The fundamental difference is that we are going to actually get the design and make a decision at that juncture, as opposed to where the design is not completely finished and you don't have a true feeling of what the hardware is going to cost.

Let me just finish up. We talked a lot about—and I am sure you will hear about it again from OSD—the subject of multiyear procurement, and I won't go into the details of that change.

There is one other item that I am very keenly concerned about and that has to do with the programing threshold which is currently $2.0 million. That threshold was set a long time ago. We would recommend strongly that the Congress consider raising that threshold to $10 million. That is to give us more management flexibility in terms of fixing problems internally without having to go through the effort of large numbers of reprograming requests on the Hill.

CURRENT SPENDING LEVEL

Senator STEVENS. What is your level now?

Mr. CANN. $2.0 million, and it has been that for many, many years.

We are prepared to discuss many Marine programs, in particular the LVT, MPWS, and HXM programs. But before we open it up for questions, I would like to just make a couple of comments about the LAMPS program.

I have with me in addition to these gentlemen, Vice Admiral Seymour, Commander of Naval Air Systems Command, who is here to assist in discussions on both LAMPS and the F-18.

The LAMPS III program has come under considerable criticism because of cost growth, but I would like to make a couple of important points.

First of all, the LAMPS III is an extremely important part of the Navy's ASW capability. Without getting into any details, which I would be happy to discuss later on in closed session, I think I can demonstrate to you that it is of great importance to make sure that the system continues.

With respect to the cost growth, we have had several intensive reviews, one that was started by the Under Secretary of the Navy, to look at the reasons for the cost growth.

We have determined that we had unanticipated inflation which you hear about, and we had some internal problems in cost estimating. Admiral Seymour is prepared to discuss with you some ideas and plans we have to improve our total cost estimating situation.

We have also had some problems with contractor factors which relate to cost, that is, we have had some manufacturing problems with Sikorsky. We had the Sikorsky people doing an intensive review of their process, and we are taking a hard look at their results.

There is something I would like to point out, and it is not by way of an excuse, but it is an important point to consider, which is that the LAMPS program's cost growth is about 30 percent. It turns out that the average for Navy programs has been about 29 percent, so the cost growth is lamentable but it is on the average running along with the rest of the pack.

The only other point I would like to make before opening this up for questioning is that the LAMPS program is an extraordinarily complex program and is one of the first times we tried to aggregate a program under one heading that included ships, aircraft, land facilities and a number of other things. It has been an enormous success. We have met all of our technical milestones and have only experienced about a 3-percent R. & D. cost growth over the last 3 or 4 years; and we have every expectation that the system will successfully enter the fleet on schedule and meet all of its technical objectives.

PREPARED STATEMENT

Senator STEVENS. Before we continue, Mr. Cann, we will insert your prepared statement in the record.

[The statement follows:]

PREPARED STATEMENT OF GERALD A. CANN

Acting Assistant Secretary of the Navy (Research, Engineering, and Systems)

I. PROGRAM OVERVIEW

A. Introduction

Mr. Chairman and Members of the Committee:

Navy's FY 1982 RDT&E Program. This program, with the addition of the FY 1981 Supplemental and FY 1982 Amendment, has been structured to support the Secretary of the Navy's priorities which are to: (1) establish and manage a building and modernization program to regain superiority, and (2) reform the R&D/Procurement Cycle to shorten the acquisition time. I will briefly discuss the broad objectives of the Navy's RDT&E Program. I will then touch upon some of our plans and initiatives for reducing acquisition times and, finally, will highlight some of the additional work we wish to pursue in FY 1981 as stated in the Supplemental Request and some of the more important RDT&E Programs planned for FY 1982.

With me today are Vice Admiral Robert R. Monroe, Director, Research, Development, Test and Evaluation for the Chief of Naval Operations and Brigadier General Jacob W. Moore, Deputy, Chief of Staff for Research, Development, and Studies, U.S. Marine Corps. They will provide information as required in support of this statement and in response to your questions.

With your permission, I will provide for the record, a statement which describes the Department of the Navy's FY 1981 Supplemental and FY 1982 Amended R&D Budgets and the R&D programs which support the major missions of the Navy.

I will now discuss our principal R&D objectives and present a broad outline or overview of our planned programs for the remainder of this year and FY 1982.

DEPARTMENT OF THE NAVY MAJOR R&D OBJECTIVES

The continued buildup of Soviet Naval Forces is of particular concern not only because of their numbers, but because of the increasing quality and capabilities of new Soviet aircraft, ships, submarines, and other systems. The Backfire Bomber, the Kirov Class Cruiser, and the ALFA, OSCAR, and Typhoon Submarines represent important Soviet achievements. These continuing increases in Soviet naval power are having a major impact on the R&D and weapon system needs of the Navy. To offset this growth in Soviet power: (1) we must develop improved weapons that will be effective against high performance Soviet units, (2) we must increase the quality and quantity of our own ships, aircraft, and equipments, and (3) we must reduce the length of the acquisition cycle for all systems.

With respect to the need for improved weapons, I should first call your attention to the fact that many of our existing weapons could become relatively ineffective against the newest Soviet aircraft, ships, and submarines--particularly under circumstances in which the Soviets made extensive use of decoys, intense levels of jamming, and other forms of countermeasures available to them. We must continue to increase the lethality and operating characteristics of our anti-submarine warfare weapons if these weapons are to be effective against the latest double-hulled, high-speed, deep-diving Soviet submarines. We must increase the performance of our anti-air and anti-surface missiles for analogous reasons in the anti-air warfare and anti-surface warfare missions.

We not only need to upgrade our existing weapons and to develop some new ones, but we must intensify our efforts to acquire these required capabilities more efficiently and at the least possible cost. Where this can best be accomplished by modifying and upgrading existing weapons in a highly selective, evolutionary way, we intend to do so. This approach is being followed, for example, in the PHOENIX, SIDEWINDER, and SPARROW Missile Programs, and in both our MK-46 and MK-48 Torpedo Programs.

In parallel with this work, we plan to continue efforts to acquire a number of new weapons urgently needed to improve our posture relative to the Soviets. The following major weapon development and acquisition programs fall in this category: TRIDENT I, the TOMAHAWK Cruise Missile, the High Speed Anti-Radiation Missile, the Advanced Lightweight Torpedo, and the ASW Stand-off Weapon.

INCREASE THE QUALITY AND QUANTITY OF PLATFORMS

Now let me turn to our second broad objective; that of increasing the quality and quantity of our ships, submarines, and aircraft. The Secretary of the Navy has stated the need for a 600-ship force including 15 battle groups. These shipbuilding and modernization plans and schedules must, of course, be directly supported by relevant RDT&E plans, programs, and schedules. The new systems being developed for these ships and submarines are being tested more extensively than any previous generation of systems to assure performance, reliability, and maintainability. We intend to pursue and extend the policy and practice of assembling, testing, and integrating at land test sites total systems including sensors, fire control subsystems, weapon launchers, etc., before such new systems are delivered to the shipyards. The AEGIS, FFG-7, and Nuclear Power and Propulsion Programs have proved the efficiency and economies of this practice.

Increasing attention is also being given to the task of designing these increasingly complex systems so that their various subsystems can be readily upgraded or even replaced without necessarily having to make changes in the remainder of the system. There is a strong push to have weapon systems that are modular and that feature distributed architecture.

Further economies will be attained by our continued efforts to standardize upon a relatively small family of computers, displays, signal processors, communications, and navigation equipments that will be used in various major subsystems and in different platforms.

The rate at which engineering and software changes and improvements will be introduced in our future shipbuilding and modernization programs must also be better controlled and disciplined than in the past if we are to have fewer "one-of-a-kind" ships and submarines, and if we are to improve the efficiency of our logistics support and personnel training programs and operations.

Some of our major platform acquisition programs which embody or reflect these principles and objectives are the DDGX Major Surface Combatant program, the F/A-18 aircraft program, the Light Airborne Multi-Purpose System MK-III program, the Submarine Advanced Combat System program for SSN, and the AV-8B aircraft program.

REDUCING ACQUISITION TIMES

The third broad objective I wish to discuss concerns the length of the acquisition cycle. The Department of the Navy, in conjunction with the Office of the Secretary of Defense, is critically reexamining the various policies, practices, regulations, and other factors that contribute to the length of the acquisition cycle. I believe that acquisition times can be substantially reduced by streamlining the decision-making process; focusing more attention upon the planning portion of the Planning, Programming, and Budgeting System and better integrating the programming and budget portions with the Defense System Acquisition Review Council (DSARC); by simplifying the DSARC process itself; by further decentralizing and delegating responsibility for certain categories and levels of decision and management; and by a number of other actions.

A careful review of the history of a large number of system acquisitions reveals that the decision-making process itself accounts for a large part of the increase that has occurred in our acquisition process. It is important to note that the actual time required to carry out a broad range of engineering developments has not increased markedly for programs that have been properly planned, funded, and managed. Typically a full-scale engineering development program requires from three to seven years; the time being dependent upon the nature or size of the program, the experience and competence of those responsible for the management and execution of the program, and our ability to provide the required budgeting support. Unfortunately, many acquisition programs have been deliberately stretched out because we have been unable to program sufficient funds to carry them out efficiently.

We are addressing each of the foregoing categories of problems which contribute to the lengthening of the acquisition cycle, and have some definite solutions in mind.

For example, we can expedite the transition from development to production by beginning the detailed planning for production earlier in the acquisition cycle, and, in particular, by devoting earlier effort to the tasks of: (1) increasing the efficiency of the planned manufacturing operations, (2) identifying the required manufacturing tooling and test equipment, (3) identifying the long lead time materials and parts that must be ordered first, and (4) improving our cost estimating capabilities so that our initially programmed procurement budgets will be more realistic. This will require that procurement funds be available in engineering development for this purpose.

Some of the factors and constraints that contribute to the length of the acquisition cycle will, however, require congressional action if we are to overcome them. For example, there is a growing consensus, I believe, within the services and the Office of the Secretary of Defense, of the need for: (1) increased authority to award multi-year procurement contracts, (2) the establishment of budgeting line items for management reserves for programs funded by the RDT&E appropriation similar to those authorized for the Ship Construction, Navy appropriation, (3) an increase in the threshold for reprogramming actions, and (4) agreement of the need to have procurement funds during full-scale development for pilot production.

It has been suggested for many years that time and cost economies can both be realized in many production programs by shifting to multi-year procurements vice annual procurements. Not only can the uncertainty be reduced and the stability of our production plans, programs, and budgets be enhanced by such a change in our procurement practices, but such contracts would encourage major capital improvements in the manufacturing capabilities of the defense industry. Furthermore, were we able to negotiate more multi-year procurement contracts, much less time and effort should be required each year to maintain the integrity of our procurement programs and budgets; programs should be less vulnerable to reprogramming actions; and more attention could be focused upon the critical production problems and upon the control of the execution of these programs.

A budgetary management reserve is needed in RDT&E in order that we may have greater flexibility in quickly addressing unforeseen technical problems and difficulties. Such a reserve would enable us to avoid some of the costs and delays that result from the necessity of either having to reassess what will be sacrificed or compromised to remain within a given budget, or what other programs will be disrupted if funds are to be reprogrammed from them. Such reprogramming actions account for much of the instability and inefficiency in our RDT&E and acquisition programs.

It is also timely to consider an increase in the threshold for such reprogramming actions. The current theshold was set many years ago. Inflation has drastically reduced the amount of technical work that can be accomplished at this threshold. Consequently, the Navy strongly supports the idea of raising these threshold levels.

RDT&E PROGRAM OVERVIEW

Having discussed our broad objectives and some of the actions by which we hope to reduce the length of the acquisition cycle, I wish now to turn to two charts which present a summary overview of our RDT&E Budget requests for FY 1981 and FY 1982.

The first chart summarizes the principal changes proposed in the FY 1981 program by the Supplemental Budget. About one-third of the increases are for the support of our key weapon systems and this is in line with our first R&D objective. Another one-third of the increases are for the support of two of the platform developments, VIZ., the--F/A-18 aircraft and the DDGX Major Surface Combatant. The FY 1982 Amendment changes are also displayed in this chart.

CHART I

SUMMARY OF R&D IN FY 1981 SUPPLEMENT AND FY 1982 AMENDMENT

Program	FY 81 ($M) Supplement	FY 82 ($M) Amendment
WEAPONS		
ALWT	18.0	24.0
MK-48	16.0	9.0
ASW SOW	—	25.0
CS Mine	—	15.0
HARM	16.0	8.0
SM-2N	4.0	14.0
AMRAAM	—	5.0
TOMAHAWK	13.0	34.1
SMAW	7.0	17.0
MC Combat Sust	—	9.0
MPWS	—	25.0
	74.0	185.1
PLATFORMS		
DDGX	15.0	121.0
Ship Design	30.0	41.0
Sea Lift	—	6.0
963 Feed Water	1.0	2.0
F/A-18	42.0	24.0
	88.0	194.0
OTHER		
Strategic		
ELF		34.0
C3		
ITSS	14.0	—
AJ COMM	—	15.0
Tact Ele Support	—	0.1
MC Readiness	15.0	18.0

Technology		
HEL	6.0	18.0
Prot Enh	--	9.7
Other		
RDSS	--	11.0
DDG-37	--	2.0
MK-92 FCS	--	15.0
SDMS	8.0	8.0
BQM-34	--	9.0
Retract Amber	--	9.0
Crown Helo	2.0	1.0
Spec Act	5.0	8.8
	50.0	158.6

TOTAL R&D ADDITIONS

FY 81 Supplement	$212M
FY 82 Amendment	$512.7M

CHART 2

SUMMARY OF RDT&E BY MISSION AREA

Congressional Budget Activity	FY 1981		FY 1982		
	$M	% Total	$	% Total	% Increase over FY 81
Technology Base	701.6	13.9	808.4	13.3	15.2
Adv Tech Base	154.4	3.1	167.3	2.8	8.4
Strategic	407.4	8.1	540.6	8.9	32.7
Tactical	3,096.7	61.4	3,709.2	61.0	19.8
Intell & Comm	142.7	2.8	195.5	3.2	46.2
Defense Mission Support	539.2	10.7	662.3	10.8	22.8
TOTAL	$5,042.0	100%	$6,083.3	100%	20.7%

The second chart displays the total revised Navy RDT&E Budgets for FY 1981 and FY 1982 and shows how much we plan to spend on programs in the Technology Base, for Strategic Programs, Tactical, and other programs.

Let me say a few words about our Marine Corps Programs. Some of the more important RDT&E Programs we wish to pursue in FY 1982 in support of the Marine Corps are the AV-8B Aircraft Development; the Mobile Protected Weapon System--a lightweight, highly mobile, armored vehicle which is to have a high velocity, automatic 75mm gun; lightweight armored vehicle developments; and initiatives to improve Marine Corps communications equipments, air control systems, target designation equipments, their ground combat weapons; and lastly, their field logistics support systems. These will be discussed in more detail by General Moore in his statement. Thus, I have not elaborated on these extremely important activities.

At this time, Mr. Chairman, I will enter the remainder of the detailed RDT&E Posture Statement into the record, and we are ready to address your specific questions. Thank you.

TEST-ITEM FILM

Mr. CANN. I understood that you had to leave at 8:50.

Mr. STEVENS. That has been changed. We don't go into session until 11 today, and I will have to leave at 10:30.

Mr. CANN. Depending upon your views, we had talked to your staff, and we have an unclassified movie of test-item film that we have put together that we thought would be useful to show you. It is about 7 or 8 minutes; it is a very interesting film narrated by one of our people and, with your permission, we would like to show that now.

Mr. McMillan will narrate the film.

Senator STEVENS. Just for everyone's information, we will plan at 9:30 to go into a closed session to discuss the item you have, and I have one item. I don't know if Senator Rudman has any in mind, and I think he does. We can discuss this and people can make their plans. We will close the session at 9:30, unless there is objection.

[A film presentation follows:]

F/A-18

Mr. MCMILLAN. The F/A-18, designed as a multirole aircraft, is programed to replace the Navy's A-7's in the attack role and the Navy and Marine F-4 aircraft in the fighter role. Since completion of initial at-sea tests in October 1979, Navy has continued testing of the aircraft's capability.

Senator STEVENS. Can the F/A-18-launch cruise missiles?

Mr. MCMILLAN. No, sir. This is the medium-range Sparrow missile. We have also launched a short-range Sidewinder missile. Testing of the attack capability has been initiated with bombing runs and we have successfully separated the auxillery fuel tanks. We have fired over 40,000 rounds from the 20-mm cannon without any significant gun or airframe problems.

The aircraft operational envelope has continued to be expanded. An altitude of 53,000 feet has been achieved, as has a speed of mach 1.9.

Testing will be continued with multiple aircraft in a squadron-like environment. The first squadron, a Marine squadron, will complete transition in 1983.

25-MILLIMETER GUN

In December of last year at Naval Weapons Center, China Lake, Calif., the 25-mm gun planned for use in the AV-8B was tested. In this AV-8A installation the gun is in the left-hand blister and the ammunition is carried in the connected right-hand blister.

The tests consisted of 1.5-second firing bursts against U.S. M-47 and Russian T-62 tanks, using depleted uranium armor-piercing projectiles. About 60 rounds were fired in each burst.

The results of these firings produced an observed kill potential within the confidence level of our predictions. The armor-piercing projectile exceeded expectation by penetrating more than expected. After more than 15,000 rounds, the gun system is demonstrating excellent accuracy, reliability and durability.

LAMPS III

The LAMPS III helicopter/ship system is at sea for testing onboard U.S.S. McInerny, FFG-8. One aspect of these tests is use of the recovery assist securing and traversing system, or RAST, without which landing in heavy seas would not be possible.

As the helicopter approaches the landing area and enters a hover, the pilot lowers a lightweight cable to the deck of the ship. The deck personnel attach this messenger cable to the heavier recovery cable from the RAST. The pilot then reels in the RAST cable, securing it to the helicopter.

From the console in the enclosed operator's compartment, the landing signal officer or the RAST operator maintains a constant tension on the cable. The pilot is required to maintain a steady heading and a constant, positive lift on the helicopter.

Observing the relative attitude and motion of the deck and the helicopter, and accounting for wind, the landing signal officer hauls down the helicopter until it is on deck. Upon landing, a probe in the bottom of the helicopter is locked into the RAST, securing the helicopter to the deck. The RAST is then used to move the helo to and from the hangar.

Senator STEVENS. Were there any unsuccessful tests?

Mr. MCMILLAN. No, sir. The ship rolled as much as 28° to 30°, and still we were able to haul the helicopters in successfully.

VERTICAL LAUNCHING SYSTEM

Shown at White Sands Missile Range is a preproduction model of the vertical launch system module which will enable CG-47 Aegis ships and DD-963 ships to launch surface-to-air, surface-to-surface and ASW missiles.

Last November, a firing of three Standard missile II launch test vehicles was successfully accomplished. The first two missiles were ripple-fired, while the third was intentionally delayed 4.5 minutes to demonstrate the safety of firing with missile exhaust products from the previous firings still present in the system.

A Standard missile II, fired in January to test the missile guidance capability after vertical launch, scored a direct hit on the target drone.

Another vertical launch missile, a land-attack Tomahawk, successfully launched from the Pacific Missile Test Center last November, is seen in this slow-motion sequence. The Tomahawk navigated to the Utah Test Range, utilizing the terrain contour matching guidance, TERCOM system.

SHIP-ATTACK TOMAHAWK

The vertical launch system can also launch the ship-attack version of the Tomahawk. This flight, while submarine launched, from the currently installed torpedo tubes tested a ship-attack variant against a destroyer hulk at a range of about 100 miles. For safety reasons a range instrumentation solution was used to target the ship; however, the over-the-horizon targeting system was also tested.

Senator STEVENS. What is that range of the Tomahawk?

Mr. McMILLAN. I can't provide that in an unclassified session, sir.

This is a slow-motion sequence of the impact of the missile. The explosion is caused by residual fuel in the missile. That was not a warhead shot.

HARPOON MISSILE

Another surface, air and submarine-launched Navy missile is the Harpoon.

Last July, and A-6E aircraft from VX-5, without external assistance, carried out a Harpoon attack against a drifting destroyer hulk. Utilizing the aircraft integrated track-and-search radar, the target was located and the missile was launched at a range of over 40 nautical miles. After flying to the target at low level, the Harpoon impacted the ship.

As all fuel and ammunition had been removed from the target ship, the damage shown was caused by the single Harpoon warhead. As can be seen, the superstructure and hull were severely damaged, damage which was extensive enough to cause the destroyer to sink.

Development of this tactical air-launched missile is now complete, and Harpoon is in the fleet.

Mr. Chairman, this concludes the film presentration.

Mr. CANN. The question you asked about cruise missiles—the F/A-18 is currently not planned to carry it, but it certainly could carry the Harpoon cruise missiles and it could be configured for that.

We are open at this point for your questions.

LAMPS MK III COST GROWTH

Senator RUDMAN. I would like to follow on the chairman's initial line of questioning with you on something that has become very apparent to us in our hearings with all the services thus far.

You have a chart on LAMPS III which you furnished us here this morning which gives you the reasons, but not the explanations, if you will, for the growth in costs in some of these programs.

REASONS FOR LAMPS MARK III NAVY COST INCREASES[1]

(FOR ELEMENTS REVIEWED)

DECEMBER 1979 - DECEMBER 1980

(THEN-YEAR MILLIONS $)

	NAVY-INDUCED CHANGES	NAVY ESTIMATE ERRORS	CONTRACTOR	UNANTICIPATED INFLATION	OTHER THAN NAVY MANAGEMENT	TOTAL
G.E.		$ 25.7 M	$ 9.4 M	$ 74.3 M	$10.4 M	$119.8 M
SIKORSKY		149.8	150.5	84.8		385.1
IBM	$29.4 M	105.5	42.8	65.5		243.2
GFE				97.4		97.4
	$29.4 M	$281.0 M	$202.7 M	$322.0 M	$10.4 M	$845.5 M
	4%	33%	24%	38%	1%	100%

[1] COST INCREASES COMPUTED ON BASIS OF MAINTAINING A 4-YEAR AIRCRAFT SCHEDULE OF 18/48/64/74. IF AIRCRAFT PROGRAM CHANGES TO SAR 80 5-YEAR SCHEDULE, HIGHER COST INCREASES CAN BE EXPECTED.

CHART 2

REASONS FOR ENGINE PROGRAM COST INCREASES[1]

DECEMBER 1979 - DECEMBER 1980

	(TY MILLIONS $)	
VENDOR PRICE INCREASES	$ 47.0 M	39%
UNANTICIPATED INFLATION	27.3	23%
QUANTITY/SCHEDULE CHANGE	10.4	9%
G.E. IN-HOUSE MATERIAL & LABOR INCREASES	11.3	9%
MANUFACTURING O/H & MATERIAL HANDLING	(2.8)	(2%)
G&A/INTEREST/PROFIT	.9	1%
COST ESTIMATING ERROR	25.7	21%
TOTAL	$119.8 M	100%

[1] COST INCREASES COMPUTED ON BASIS OF MAINTAINING A 4-YEAR AIRCRAFT SCHEDULE OF 18/48/64/74. IF AIRCRAFT PROGRAM CHANGES TO SAR 80 5-YEAR SCHEDULE, HIGHER COST INCREASES CAN BE EXPECTED.

CHART 3

I would like to discuss that chart with you.

Obviously, the top column here indicates a number of classifications—Navy-induced changes, and I assume that was based on engineering need requirements that you changed along the way; is that correct?

Mr. CANN. I would like to ask Admiral Seymour to answer this line of questions.

NAVY ESTIMATING ERRORS

Admiral **Seymour**. Yes, sir, that is correct.

Senator **Rudman**. Maybe you would like to sit over there, because I am going to ask a number of questions about this chart.

The second column is entitled, "Navy estimate errors." Could you give us some understanding of what that means?

Admiral **Seymour**. Yes, sir. When we start a program—in the case of LAMPS in 1975—we make an estimate of what it will cost in production, and that is what this primarily is aimed at, this whole chart, because the major cost increase in LAMPS have been in the estimated production costs.

In 1975 we knew what it was, conceptually, and we had to estimate what it would cost. But, to estimate what it would cost in the years 1982 to 1985, we used parametric methods. In other words, if it is a 12,000-pound airplane, historically it costs $20 a pound. That is for manufacturing. The aircraft also has certain kinds of avionics in it and we have a historical base which we use to price avionics. For example, computers cost so much per pound, or so much in volume, or another parameter which we could use would be based on the throughput of the computer.

We assembled all of these together and then applied factors to derive the cost for the support or below the line items which are required in production. That gave us a baseline, which we expected to pay in the production years for LAMPS III, $2.6 billion. That was the starting point of the Navy estimate errors.

What we did in 1979, when we repriced the shipboard part of the program, and in 1980 when we repriced the aircraft part of the program was to accumulate that amount of errors, $281 million, from our original estimate, to what we now estimate it will cost in the years 1982 through 1985.

These are in then-year millions of dollars, so there is a significant amount of inflation in each of those.

Additionally, the differences between the indices that we were allowed to use originally when we priced the program and those which actually occurred are substantial.

For example, in 1975 we were allowed to use 4.4 percent each year throughout the decade. As we approached the production program, the OSD indices were even higher. This has added some inflation and we all know that inflation has been higher than the indices in the past.

What we have actually spent in production for LAMPS is very minimal—we just went into contract this year.

EFFECT OF INFLATION ON LAMPS III ESTIMATES

Senator **Rudman**. Well, the columns entitled, "Navy estimate errors" and then "Contractor errors," I assume are in estimates?

Admiral **Seymour**. Yes.

Senator **Rudman**. If I could finish those two columns, one is $280 million—they are exclusive, are they not, or do I misunderstand your chart of the fourth column, the "Vendor price increases". Isn't that the column that reflects the basic inflationary pressures, or are they also included in the previous two columns?

Admiral **Seymour**. No, sir. You are correct, the fourth column, "Economic index changes" and "Vendor price increases," applies specifically to what I just addressed—the change in the index.

Senator **Rudman**. So what we have here is $322 million, which is 38 percent, which obviously the Navy and the contractors have no control over whatsoever, and we would have to say is uncontrollable from your point of view?

Admiral **Seymour**. A portion of that, sir. What we have done, unfortunately in that column, is to include "Vendor price increases." which includes things such as coming out from under an option. We estimate at this time that when some of the vendors for Sikorsky come out from under option in 1983, their price will go up. They will say it is due to inflation and one could argue now that it is due to inflation if there have been no design changes in the part between the time of the original price and the time we receive a new price in 1983; but that is included in there and we are not permitted to call it inflation.

Senator **Rudman**. For the purpose of my questioning, let us assume that those are justifiable price increases caused by upward cost pressures. Deduct the $322 million from the total of $845 million, and you end up with somewhere in the vicinity of $523 million of errors, which have no relation whatsoever at all to inflation or indexing of any kind; is that correct?

Admiral **Seymour**. There is no relationship to indexing; that is correct, sir.

NAVY EFFORTS TO CORRECT ESTIMATING ERRORS

Senator **Rudman**. Now, with that background and understanding, your parametric method of pricing is also used in industry in a number of fields. What are we doing now with these new high-technology programs that are coming on line to develop systems within your responsibility, and within your responsibility, sir, that will get us into a situation?

We are not sitting here in 1984 looking at a program which we started last year which will have such an enormous error rate that we will be faced with some very difficult choices.

The reason I say that is because in looking over the growth in the three services, I can build you a chart that will show you that the growth in high-technology programs will eat up 30 percent of the GNP. Never mind what we are spending on defense generally; that is our concern; that is the chairman's concern, and it is my concern, and I want to know what we are doing about it.

When are we going to try to apply some sort of systems management to the growth of these high-technology costs?

I want to just point out to you in the LAMPS system that according to what the staff has prepared here, you showed a $41.1 million increase in the life cycle R. & D. costs 1 year ago, but the projected increase in the life cycle cost at that time was $1.1 billion. You know, this isn't the only thing we are talking about; we are talking about just a terrible number of these programs which, in my view—and I want to certainly build up this country's defenses—but I certainly think we all have to recognize this is as much a dollar war as it is a weapons war.

I want to know what we are doing about it.

Mr. CANN. Vice Admiral Seymour, perhaps you might want to tell what you are doing in NavAir, and I will make a general statement.

ESTABLISHMENT OF COORDINATING GROUP TO ELIMINATE CONTRAST ERRORS

Admiral SEYMOUR. As you pointed out, the staff has pointed out very clearly the program. The R. & D. budget has grown something like 3 percent, but in procurement, the expected procurement budget has gone up 30 percent in constant year dollars as Mr. Cann mentioned. As he said, this is historical and it bothers me and bothers all of us.

What I have done is to establish a coordinating group on the LAMPS program made up of the presidents of the companies, because I find that to some extent the reason for either Navy estimate errors or contractor errors, some on both sides, was that there was an unclear indication to the contractor as to what it was we wanted him to price when he gave us what we call a "not to exceed" ceiling price proposal last fall. The production proposals come in this month, May 18 is when I get Sikorsky's, and that will give me a definitive list of what he proposes to do, the price for each item.

Of course the total cost will be given for the 1982 production year. We normally, and have always, once we get the proposal, audit and evaluate it. We then negotiate it and then we sign a contract. The contract signing is expected to be a year from now. All of that takes essentially a year, during which time the contractor is working. During negotiations, we may tell the contractor, for example, we don't want you to do that, it costs too much so take that out, and that is why contract definitization takes so long. Once a contract is definitized the contractor proceeds and we normally try not to change it because it may require an adjustment in the contract price.

In the "not-to-exceed" ceiling price quotes of last fall, we found that there was a disconnect. For instance, Sikorsky's estimate was based on two complete production lines for the Black Hawk and Seahawk. The Navy estimate had included a single production line using common tooling for both aircraft. Obviously there was a big difference in price estimates there.

As a result of disconnects of this nature I have set up a coordinating group to be sure that the presidents could deal with me at any time they had a concern. Possibly, their program managers when dealing with my program managers had disconnects in communications or disagreements with each other and neither one was bringing it up to a higher level to get it solved. We have met three times and intend to meet monthly until we really have this scoped and under control.

I think it has been very useful. Related to that, though, because the program manager at Sikorsky didn't tell his boss, and my program manager didn't tell me until the papers met, everybody was surprised. I have established two policies in NavAir. One policy is that any time we ask for a price proposal, whether it is a production proposal, a "not to exceed" ceiling, or whether it is a budgetary estimate for the 1983 budget, NavAir will provide in writing the ground rules for that proposal. The fact that there will be one or two production lines, the delivery period from such and such a date to another date, and the quantities, will be put in writing to the contractor because too often we ask them for a proposal and when we get it discover that the contents of the proposal are not really what we wanted.

Everybody focused on the bottom line which is appropriate but unless you understand what is built up into that bottom line you don't realize that you have a problem. So, the policy that NavAir always put out in writing the ground rules or assumptions to be used for any proposal to any contractor, and not just LAMPS, hopefully, will reduce the number of surprises that we get in instances when a program manager asks for a proposal from a contractor and then gets one that is significantly above his budget.

If he gets one that is above his budget he has to do a number of other things. He increases the budget which is the simplest thing to do in some cases, or he rescopes the program, which is normally what we force him to do or try to force him to do. The budgeteers calls it "scrubbing the program," but we rescope it. For example, on the LAMPS program, we took out "over the horizon" targeting as a prime function in 1978 and took essentially $400 million out of the proposed production program.

EXTENDING R. & D. PROCESS

Senator **Stevens**. Could I interrupt right there. My difficulty is that it seems to me in R.D.T. & E. you don't have a sufficient length of the program to actually make commitments to contractors on the production area out of R.D.T & E. before you complete your own phase. So that the contractor relying on the fact he is going to get a substantial production order goes in and incurs costs which go far beyond the R.D.T. & E. phase.

You are still in R.D.T. & E. and you are making changes that are reflected in the contractor area and that is where the cushion comes that they are building in against all of those changes that still come out of R.D.T. & E. Why don't you stretch out your R.D.T. & E. and call it research and development and test evaluation rather than going into the production line so early?

We are seeing these costs just reverberate through the system and they are coming about primarily because of the changes that are being made while you are still in evaluation and still in test.

Admiral **Seymour**. Part of it, to put it in perspective, is that by stretching it out further I will be even more unsure of what my production costs are when I come to get my R. & D. money to do the R. & D. program. It has been my experience that when I ask for R.D.T. & E. money for a program that will go into acquisition, I am always asked what is the cost of the acquisition. I cannot justify a significant amount of R.D.T.& E. money without standing up and saying I expect to have to spend $1 billion or so in production, or whatever the amount may be. By stretching it further, I will make my cost estimating probability of accuracy even worse than it is now.

This is not an argument to compress it any further, but the main reason is that in a lot of aviation programs, particularly a large airplane such as the LAMPS helicopter, once I am into R.D.T. & E.

for 5 years and I am now flying 5 aircraft successfully, as you saw in the movie, it is performing well, it makes sense to start the production line to gain. This will allow me the benefits of lack of inflation at least by getting it started, and getting it into the fleet.

We always have to say, "Hey, we need this now to meet this schedule," and by stretching it out, in my judgment, we will probably add to the inaccuracies of the total program estimation.

Senator **Stevens**. I am not being personally critical of you but it seems to me the system that puts 3 percent in R.D.T. & E. and goes into 35- or 40-percent allocation to production before the first phase is done, is out of whack.

Admiral **Seymour**. Sir, we are starting OPEVAL tomorrow in the LAMPS Mark III. We have committed and so far obligated $70 million of the 1981 advance procurement funds for the 1982 buy of 18 aircraft. Today we start OPEVAL on the Mark III helicopter, we will finish this summer. We will have a provisional approval for service use and by this fall, we will have essentially obligated the Government to only $105 million, all of which is the 1981 advance procurement money.

RISK ASSESSMENT IN PROGRAM DEVELOPMENT

Senator **Rudman**. I would like to make one comment on this same pertinent point and then I would like to hear your general comments. Hearing all of that, and understanding the reasons, there is something startling about looking at just this chart and understanding that in this one program between Navy estimate errors and contractor errors you have nearly half a billion dollars in this one program, $281 million Navy and $202.7 million.

I simply want to say that from my point of view we are going to have to find a way to do this better or we are going to be sitting here in a couple or 3 years having to cut major programs, after having spent enormous sums of money on them, and truly impairing the national defense. What I am saying is that those who really want to improve this Nation's defenses had better start looking at how we estimate some of these things or we are not going to have the money to do it.

Admiral **Seymour**. That is what I am trying to do.

Mr. **Cann**. There is no question about that and I have been very close to this program for some time. I understand what is going on in this program and I would like to make a couple of comments because I think it is important for all of us. We all learn in this experience over time. One of the important problems we are facing today is that systems are not like they were, say, in World War II where you build a ship and you have individual subsystems, and each gun was operated independently, and your telephones were coordinating everything. That was a pretty simple system and that is why we were able to build so many ships.

What we have been doing, especially in the last 10 or 15 years, is to go to more and more highly integrated systems. LAMPS just happens to be on the very high side of that. One of the more amazing things is the fact that LAMPS has been such a technical success because you would have expected it to be a technical disaster due to the large number of interfaces between the ship, the aircraft and all of the rest of the people involved.

But the difficulties that we have inside the Navy trying to manage these programs are many. What we are attempting to do to get better control over the entire process is to do a better risk assessment at the entry into full scale development. I could talk about one program which I know you are interested in, which I have been interested in 15 years, the RDSS program. We made a decision to fund the system that would be aircraft monitored and that is the system we plan to put into production. Off on the side, completely on the side out of the purview of the program manager so he doesn't get into a high technology adventure, we have commissioned in exploratory development activity in an effort to look at satellite activity. We will be in a position to make that decision some time about the time we go into production.

That is what we are trying to do in a number of cases, that is, we will put in the production the aircraft system but talk about a block change. One of the conscious decisions we have been talking about is the whole notion of deciding where the low risk potential is, deciding what we are going to build, and taking all of the high risk or medium risk or however you define it, that we feel we need to get into the system and bring them in as block changes. This is opposed to continually changing the design so that when you get to production decisions you don't have a producible system.

I think that is part of the issue you are talking about.

On top of that I think we need to pay much more attention to what I call the acquisition strategy and the source selection which are the basis on which we are making selection criteria. One thing I feel very strongly about is when you get all through with this process, it is the people who make it work. We need to do a better job, at least in the Navy, in the training and nurturing of program managers. One of the policies we have been trying to get started, and with some success, is you don't become a program manager for a major program like LAMPS without having some prior program manager experience.

You need training, experience and continuity. Continuity is very important, and we need to work much harder on that whole issue, as well as the cost estimating that you heard about.

EFFORTS TO CORRECT COST PROBLEMS

Senator RUDMAN. Is there a project or task force under way now in the Navy to seriously start looking at why these things have happened over and over again? You have explained, I think, with some accuracy why it happened. I guess what I am asking is this—is there any system under way Navywide, and not just in the Admiral Command, but in the entire Navy to start to put systems in Navywide that will start to recognize and anticipate these problems which happen over and over again?

What is going on; that is what I would like to know.

Mr. CANN. First of all, I want to make sure you understand that some of us have been discussing these problems continuously. I have been with the Navy for 4 years and before that I was with OSD, and I have been concerned with systems engineering problems my entire working life. Admiral Whittle, who has been the Chief of Naval Material, and a very fine one, has worked very hard with us and with his own staff, and with the Systems Command to improve the overall estimating and program control of the programs.

What all of us tend to look at are the losers. Programs that are successful you and I don't hear about very often. It is all of the programs that have difficulty that we spend 99 percent of our time on. In addition to that I have spent some time in the last 2 or 3 months in great detail with the staff, and Chief of Naval Material, to come up with a program for improving the source selection process, the acquisition process, training and cross-training of program management people and trying to get better continuity, and it is a major thrust.

I discussed this with the Secretary of the Navy and he has been interested in pushing this because we all believe that we have to do a better job. There is no question about that. I would say the same thing you said.

Senator RUDMAN. I might make one last comment, Mr. Chairman. You said something in your response to the previous question about the integrated systems that have such high technology and pushing the state of the art, compared to the World War II ship construction. Of course, that is a great philosophical debate anyway which we are going to have to address in this committee and I think this whole Congress is going to have to address, and that is whether or not we start to do something different in terms of procurement, whether or not we continue to push the state of the art or maybe go for more numbers.

That is a whole different question. But there was no question that with the systems I have heard about in the last 4 months, many of these were conceived in someone's mind and given to a contractor and it is truly amazing that they got them to work. But the problem is, at what cost?

R. & D. FUNDS FOR "NEW JERSEY" AND "ORISKANY"

Senator STEVENS. Let me go on to some other things. I think that we should continue the dialogue, though, because it is starting to bother those of us on this subcommittee who have been listening to the testimony from DOD these past months.

Your budget amendment for R. & D. funding for activation of the carrier *Oriskany* and the two battleships, it is $8 million for the *Oriskany* and $2 million each for the *New Jersey* and *Iowa*. If we decide to eliminate, and after all the Armed Services Committee has already eliminated the *Oriskany*, if we decided to eliminate the advance procurement funding for these vessels in 1982, would you still recommend that the R. & D. funding for the ships be retained?

Mr. CANN. Absolutely.

Senator STEVENS. Why is that.

Mr. CANN. Presumably, and I don't know why you are going to delete the money, but——

Senator STEVENS. We just saw the Harpoon hit a destroyer and some of us are not convinced that these battleships need to be floated. I saw the Secretary of the Navy's comment in U.S. News and World Report and his comment notwithstanding I am still not convinced. If we decide to eliminate it why should we put the R. & D. funding in too?

Mr. CANN. I think one of the issues has been the cost issue of bringing those ships out.

Senator STEVENS. We don't have any estimates of the cost.

Mr. CANN. Until we have an opportunity to use the R. & D. money to develop all of the necessary data, we won't have the information to answer your questions.

The battleship would be a very important capability, and as you indicated the Harpoon is an effective weapon. We have plans for putting a close-in weapons system on battleships which would hopefully help in the case of the Soviet cruise missiles. Besides which the battleships and I am sure Admiral Locke talked about this, are very tough ships; much tougher than anything we have around today.

BETTER COST ESTIMATES FOR BATTLESHIPS

Senator STEVENS. I would like to talk about that and I don't know whether this is the place to do it but it is my impression that the overhead burst above a battleship is the same as with anything else, it is going to have to go out. Everybody tells us and we hear the battleships are almost unsinkable. Well, so what? What is going to happen to the equipment if it has a sustained attack? I don't think anyone has explained that to us, but beyond that, why should we proceed at all with the kind of estimates we have. We have a great "F" level estimate for those battleships. Congress last year said no, and if Congress says no this year, do we still have to face the use of $2 million to find out why we should say "yes" next year?

Admiral MONROE. I might try to answer a few aspects of that. This small amount of R. & D. money is to complete, as Mr. Cann said, detailed ship checks of the battleships, to identify which piping systems might need to be replaced, which electrical system might need to be replaced, and what would be the cost of adding close-in weapons systems for self defense against missiles in view of the interference that might have to be removed. There are also below decks changes that might be necessitated by putting armored box launchers for Tomahawk missiles and canister launchers for Harpoon missiles on the deck.

These class F estimates that you have from our Naval Sea Systems Command are reasonably good but they are not accurate to the nearest million dollars and probably not down to the nearest $10 million. It is these finer grain estimates that you will get through the R. & D. money that is requested in this year's appropriation.

Senator STEVENS. The estimates aren't your problem, and I understand that, and I am not harranging you about the estimate. Why should you have R. & D. dollars to do something that Congress tells you twice not to do?

Admiral **Monroe**. Once again, we believe the advantage the battleship would give the U.S. Navy and the United States of America is quite impressive. The reason we keep ships in reserve status is so that they will be available to be activated in time of need. This is such a time. Our active fleet force level is down in the last decade from 1,000 ships to below 500. It takes maybe 6 to 8 years to get a new construction ship from the point of decision into the fleet. There is no near term way we can could enhance our capability other than by bringing back ships that are in the reserve.

The analyses that we have done, that we feel it is our responsibility to present to you, show that the battleships will—because of their remaining operational life of 15–20 years, because of their immense survivability—that would allow them to take not just one but many Harpoon hits like the one you saw and still survive, because of the 12 inches of armor on their sides—significantly increase the Navy's combat capability.

PROTECTION FEATURES ON BATTLESHIP SUPERSTRUCTURES

Senator **Stevens**. But they hit the top, and no one has told me about any 16-inch steel you are going to put on top of those battleships. It may be unsinkable, but it is not immune to damage.

Admiral **Monroe**. A weapon impacting the superstructure would cause local damage.

Senator **Stevens**. That is where you are going to put the canisters on top of them, isn't it?

Admiral **Monroe**. Ultimately the cruise missiles will be below the main deck in the vertical launch system, with the tops flush with the main deck and protected against blast damage. In a topside missile hit, the ship would suffer local damage in the vicinity of the detonation. In a destroyer, this topside damage can be impressive, because most of the wiring systems going forward and aft have to run through that area, as well as many of the other ship support systems. In a battleship, with both the hull side armor protection and the thickness of the deck which is many, many times that of a destroyer, it is very difficult for a weapon to penetrate this armored box that contains most of the ship systems that are necessary for survival and continuation of a combat capability. For example, most of the wireways that run fore and aft, are below this armor. You lose those systems that are in the immediate area of the damage but the ship still has her seaworthiness, and she still has her propulsion and survivability, and she still has all the weapons systems on board that aren't in that specific area of damage.

In the case of the battleship, the current plan for the first phase, for immediate reactivation is to put 12 individual launchers for surface-to-surface missiles aboard. That is eight armored box launchers for Tomahawk and four canister launchers for Harpoon. These 12 launchers would be spread out over the topside areas of the entire ship. Thus the initial answer I gave you relates to the second phase in which vertical launch systems will be installed.

Senator **Stevens**. Are those launchers hardened?

Admiral **Monroe**. The Harpoon canister launchers are lightly armored, and the armored box launchers for Tomahawk are quite heavily armored. That is not enough to withstand a direct hit, but enough to withstand an impact in one area of the ship if they are in another area of the ship.

So in summary, battleship reactivation gives us a capability, within about 2 years, to put to sea a ship with relatively long life, with greater survivability than any ships except our carriers—better than anything else we have—and, at relatively modest expense, with the best of modern weapons systems on board. This will change their nature completely from that of the old battleship to that of a modern surface combatant with the ability to fire both antiship and land attack missiles to great distances which I can cover in closed testimony.

R. & D. MANAGEMENT RESERVE FUND

Senator **Stevens**. I will be glad to go into closed testimony, but I want to go into some of those distances and we are going to have a hearing on these battleships. You can tell the Secretary of the Navy the next time he mentions the comments I made to him privately at a dinner in connection with an interview with a national magazine, he ought to put my name right out in print because I was the one who had the discussion with him.

I still believe that this proposal does not make any sense in terms of the money we have available, and I intend to go into it extremely deeply. I want to know some of those distances and where you are going to station it. Why continue to put the same thing on Diego Garcia if that is what you want to do and put it in the Indian Ocean? Why continue with some of those aircraft we have coming along to launch the same missiles and be in 100 different places rather than have a battleship in one spot to be totally subject to attact?

Let us go to the funds and then I want to turn to my good friend here, and I am sure he would be interested in this management reserve fund which you mentioned, that would help limit reprograming actions. I would like to know how do you intend to manage this fund, and specifically what considerations would be taken into account in utilizing the funds appropriated in such reserve for particular R. & D. projects and what kind of notice would we get that you had utilized the fund, and would you be able to reprogram into the fund, and how high a budget-managed priority do you really consider this fund request, Mr. Secretary?

Mr. **Cann**. I think all of those items that you just mentioned are negotiable, and we have not made a specific proposal. Subsequent to the time when I prepared this testimony in the review that the Secertary of Defense has had of the whole acquisition process, it was agreed that this was one of the initiatives to look at as opposed to what I call a management reserve fund, which is not a very popular term.

The Army has a system they call "TRACE," which is a risk assessment process which in fact provides them with the same sort of capability. But my view of this is that the Secretary of the Navy office should have a fund, and the size is not large.

Senator **Stevens**. You mentioned $10 million.

Mr. CANN. $10 million was for reprograming authority. That would not be a fund. That would be to change the limits which we are now at $2 million.

Senator STEVENS. I misunderstood you. I thought you wanted to use that fund for reprograming purposes without notification to us.

Mr. CANN. No, the management reserve fund would be a separate fund that would not require reprograming, but it would be a fund to hold in reserve for some modest amount in the order of $50 million to $100 million, to fund programs that have definite problems of unanticipated technical nature, and not to cover up what one would call cost growth. In R. & D. programs we do have very difficult technical problems in a number of advanced development programs. One of the difficulties we have in all of these programs is that you have a cost-plus development contract process to cover the R. & D. risks you are going to have technical failures, that is part of the business of advanced development.

Right now we have very limited flexibility to fix those problems in real time. As I indicated before we do have a reprograming capability of $2 million, and as I said, I propose that should be greater but that still requires taking money away from some other programs and getting it to the particular program.

Senator STEVENS. I don't know about Senator Stennis. I think it is a very good proposal if we could get some parameters on it.

You ought to give us a paper about what you are talking about. On the other hand I misunderstood as I indicated to you. You wanted to raise the reprograming level specifically for any item in R. & D., is that right?

Mr. CANN. Yes, sir, and I will provide a paper on the management fund.

[The information follows:]

MANAGEMENT RESERVE

Material development and pilot production programs are subject to uncertainties. Program managers currently do not have a means to plan and manage for technical and program uncertainties. The result is that when uncertainties occur, the program manager is required to make undesirable funding adjustments and/or delay the program.

One of the recommendations in the review of the system acquisition process by the Secretary of Defense which was completed on 30 April 1981 concerns the incorporation of budgeted funds for technological risk. The intent of this recommendation is to increase the DOD ability to quantify risk and to expand the use of budgeted funds to deal with the uncertainty. The anticipated benefits are to achieve more realistic costs and more stable developments for programs.

The Army has developed a methodology, which is called Total Risk Assessing Cost Estimates (TRACE); it provides a process to address the program uncertainties in the development of the R. & D. budget estimates. The funds defined to resolve risk uncertainties are managed by the Secretary of the Army. The Department of the Navy has been tasked by the Office of the Secretary of Defense to utlize the conceptual approach of TRACE. It is estimated that the risk uncertainty funds managed by the Secretary of the Navy will be five percent of the RDT&E budget for all major systems and for those non-major systems managed by the Secretary of the Navy. In FY 1982 such a fund would be about 60 million dollars.

Each service has been requested by the Office of the Secretary of Defense to review the process to budget and manage funds for technological risk uncertainty for the purpose of developing an improved and tailored system. This action is to be completed by the first week in July 1981. At that time, we will provide the Committee the detail of the system proposed for implementation in the Service and clarify any help we might need from Congress in order to implement it.

R. & D. REPROGRAMING THRESHOLDS

Senator **Stevens**. And what is your proposal, it is to $10 million?

Mr. **Cann**. Yes.

Senator **Stevens**. And you would reprogram within the R. & D. budget itself, and not from any other item?

Mr. **Cann**. No.

Senator **Stevens**. In the Department?

Mr. **Cann**. Within R.D.T. & E., yes.

Senator **Stevens**. And would that be available to cover cost increases and other things that go into things like we have just talked about here?

Mr. **Cann**. Yes, sir.

Senator **Stevens**. Could you reprogram more than once, without approval?

Mr. **Cann**. No, right now we have $2 million reprograming authority and if we have to do more than that we come back to all four committees for approval.

Senator **Stevens**. How long has that been in effect, that level, $2 million?

Admiral **Miller**. It is 1959, I think.

Senator **Stevens**. We all agree that everything has gone up and we ought to look at that, and I would like to have you give us a piece of paper and history of that, and what you have been doing and particularly in your area. We would I think much rather see you have more money in your area and use it effectively and tell us whether you are going to go ahead or stop in these research and development test and evaluation areas, rather than going into production.

I appreciate what you said, Admiral. You have a good point but it seems to me you ought to have greater flexibility in this area above all other areas to make certain that what you are doing is on track and do with as little errors as possible, and I think we ought to give you the leeway you need. I might not agree with you totally on the $10 million but we ought to increase it so that you have greater flexibility.

R. & D. THRESHOLDS

Admiral **Miller**. I would be happy to provide a paper on R. & D. thresholds.

[The information follows:]

R & D THRESHOLDS

Requirements were established in 1959 by DOD Instruction 7250.5 for OSD approval of reprograming actions involving "changes of $2 million in a budget activity or in a development project or through initiation of a development project with a current year planned program value of $2 million or more or an estimated program of $10 million or more within a three year period." The current guidance contained in 7250.10 requires specific approval of the Secretary of Defense or the Deputy Secretary of Defense plus notification or approval of Congressional Authorization and Appropriation Committees in most cases for RDT&E,N DD 1415 reprograming increases of $2 million or more in any program element, including the addition of a new program element the cost of which is estimated to be $10 million or more within a 3-year period.

RDT&E thresholds have remained unchanged for twenty-two years, and are seriously impacted by the inflationary spiral. Specifically the RDT&E,N program has experienced almost a six-fold increase during the past 22 years, from $1.1B in FY 1960 to $6.1B in FY 1982. During the same period, the number of program elements (control points for RDT&E,N reprograming purposes) has increased thirteen-fold from 23 in 1960 to 303 in FY 1982. RDT&E,N price escalation indices (82 base year) have risen from 32.3 in FY 1960 to 100.0 in FY 1982.

The ability of responsible management to make adjustments in the RDT&E,N program without undue delay because of successive reviews and approvals is essential to the RDT&E,N process. At best, RDT&E,N planning has many unknowns because the investigators are in new territory, even at the engineering end of the process. Inflation has increased the dollar value of individual programs but, with the fixed limitation on below threshold changes, the percentage a program can be increased has actually decreased considerably. The $2 million reprograming limitation does not provide management with sufficient flexibility to respond quickly to changes in program requirements.

In consonance with threshold adjustments having been approved in other areas as indicated below it is recommended that the RDT&E,N DD 1415 reprograming limitations be increased from $2/10M to $10/50M. This requested increase is in approximate alignment with the other increases which have been taking place and provides for sufficient flexibility to preclude the need for changes in the next several years. Examples of recent increases include: small purchase authority, minor construction, and urgent minor construction under MilCon.

The requested threshold increases are considered vital in order to provide for the most practical and efficient use of RDT&E,N funds in light of the increasing complexity, scope, and dynamic nature of today's RDT&E,N programs.

Statistics Relevant to Request for Increase in Reprograming Thresholds
RDT&E,N Appropriation

	FY 1960	FY 1965	FY 1970	FY 1975	FY 1980	FY 1981	FY 1982
New Obligational Authority (Actual $)	$1.1B	$1.4B	$2.2B	$3.0B	$4.6B	$5.0B	$6.1B
Number of Program Elements	23	141	178	241	286	293	303
Inflation--RDT&E,N Price Escalation Indices (82 Base Year)	32.3	35.1	43.1	59.6	85.7	92.6	100.0
Examples of Threshold Adjustments in Other Areas							
(1) Use of Maintenance and Repair Funds for Construction		$25,000	$50,000 1/	$50,000	$50,000	$100,000 2/	$100,000
(2) Urgent Minor Construction under MilCon		$200,00	$300,000 1/	$300,000	$300,000	$500,000 2/	$500,000
(3) Small Purchase Authority		$2,500	$2,500	$2,500	$2,500	$10,000 3/	$10,000

1/ Increased per Public Law 91-511 of 10/26/70 - FY 1971 MilCon Authorization Act.

2/ Increased per Public Law 94-107 of 10/7/75 - FY 1976 MilCon Authorization Act and per Public Law 95-82 of 8/1/77 - FY 1978 MilCon Authorization Act.

3/ Increased from $2,500 to $10,000 per Public Law 93-356 of 7/25/74 - Simplified/Purchases Procedures Act.

Senator **Stevens**. Senator Stennis, do you have a disagreement about going into this?

Senator **Stennis**. I was going to say, Mr. Chairman, I think you are correct. I used to handle some of this in the Armed Services Committee and really went into it in detail, but items are so numerous now that you run into so many problems and a multitude of programs in R. & D. You have to make them the exception to the rule, in a way. It is better to prepare an additional rule in effect. They are primarily the ones who have to keep up with it anyway because this bill had 3,300 line items in it a year or two ago, which shows the volume in the entire bill.

REACTIVATING SHIPS

They need flexibility in R. & D. and that they deserve. I wouldn't extend that ordinarily to those programs, but let me say just this word, Mr. Chairman. I like your intensity of getting into things and stamping the daylights out of these questions, the old ships and everything. Last year in the Armed Services Committee, my opinion finally was to drop out these two old ships on the basis of priorities. It takes a lot of manpower and the research wasn't finished and we didn't have accurate and firm figures. But I can tell you, I think with the new carriers, Mr. Chairman, going at $3.7 billion each, a new modern nuclear carrier, it is time for us to look around and see if we have anything we can bring out from the old weaponry field.

We will have to swallow some weak points maybe along with it because we haven't been able to get the Navy to come out with something definite as to a smaller carrier or lesser capacity than the big ones. That is all of the increases they are asking for. They are getting right up to the edge. They haven't given our Armed Services Committee a firm line on a smaller carrier and a less expensive one. We are taking on more and more territory on our own, you might say, and no one else is doing much to help us. I think we have to look over some of the old stuff.

Just a matter of history, we got out the old battleship for the war in Vietnam. You saw it over there, and it lost out at the diplomatic table as I understood. I remember President Johnson said you couldn't get them to come to the table to talk about anything until they got that old big ship out of the way, because its big guns, you know, provided tremendous firepower.

But now it is back in the picture and I frankly would be inclined to put it ahead of the old carrier, as much as I would like to see a smaller carrier, so we can provide capability in more and more places. I am glad you are interested in it. We see it a little differently right now. This year I voted for the battleship but dropped the old carrier, and that is the way the bill is passed.

But you can go into it. I would have a special hearing on it and on this matter, too, and it will be a contribution. You can get your colleagues involved here. I don't have any questions at the present time.

Senator **Stevens**. We are going to go into a closed session at 9:30, Senator Andrews, and you came in after I made that statement.

Senator **Andrews**. I have to go back to the Agriculture Committee. I just have a couple of questions, Mr. Chairman. My apologies for coming in late.

Senator **Stevens**. I have had some complaints about our sunrise services. We are going to start at 9 o'clock right now.

EFFECT OF PROGRAM STRETCHOUT

Senator **Andrews**. I have just a few questions.

Mr. Secretary, the thing that appalls us are these increases in the costs of these naval weapons and other weapons as they come in. Now, what new setup do you have to recommend to the committee specifically that is going to eliminate these runaway doublings and tripplings of weapons system costs when they come in? You lean up against it in your statement on page 6, and you said that unfortunately many of these programs have been stretched out. Is that really one of the causative agents or what is the big problem?

Mr. **Cann**. Stretchouts are a big problem to some extent, and we discussed it earlier. There are a number of things that need to be done and we are attempting to do them. That is in order to reduce the overall costs of the program.

First of all I have to set aside inflation, because that is really outside of our ability.

Senator **Andrews**. But when you in your testimony look at stretchouts as one of the causes, in the papers I have looked at a lot of the changes along the way are Navy-asked changes. If you didn't have the stretchout you would have had time to review your specs, and we might end up with a poorer system. So it looks like maybe in place of worrying about stretchouts, you ought to do your studying up front. Instead you seem to go with a weapons system whether it is a ship or aircraft or whatever, and after you decide to go with it you are still patching along the way.

Mr. **Cann**. That is not the stretchout problem.

Senator **Andrews**. I didn't say it was a stretchout problem. I am saying the stretchout problem, whichever you want to call it may well be a problem that gives you a chance to catch up with the stuff you should have worked out before you went to bid.

Mr. **Cann**. That is my view of this whole program.

Senator **Andrews**. Am I wrong in that?

Mr. **Cann**. You are not wrong. Anything you want to say about this subject is right.

Senator **Andrews**. That is what I am afraid of.

Mr. **Cann**. It is a question of how you apply it into what particular part of the problem. As I indicated earlier, and I don't remember whether you were here or not, there are some very serious things we are trying to address, which include improving our program management capability, getting better trained managers, getting better continuity, improving our estimating ability, and improving the risk in the cycle by making a conscious decision on the first item to be put in production.

The risk will be low for the things which do have high risk and will be put into later block changes to the system. We are going more and more into evolutionary changes to the system instead of going into large brand new systems and we are going to continue to improve current systems. One of the reasons we are able to do that is by the tremendous growth in the digital electronics business wherein they keep getting smaller and their capability keeps increasing ten-fold at a clip. It gives us the ability to put into the same size package that we had before more capability. This is a very fortunate situation.

STABILIZING PROGRAM DESIGN

Senator ANDREWS. Where do we get to the point where we can impress on those of you in the service to put your package together, decide this is it, this is the state of the art, and let your contracts and go with it? The trouble is you decide that this is what you want and you decide to go with it, and then in your fiddle factory you have a dozen people that come up and say, "Well now, we have a new deal that has just been developed here in the last year," and we have some new deal over here and we ought to keep adding them in and we keep stacking stuff on the top of it.

Mr. CANN. It is exactly the thing we are trying to get out of. We have taken an extremely hard line.

Senator ANDREWS. But inflation isn't causing this.

Mr. CANN. No, it is a question of discipline, and we are instituting more discipline in this process as I indicated to Senator Rudman before. We did this on a major program that we put into full-scale development. We took the high risk part and put it back in exploratory development. We told the program manager that he will build the low risk system and he will not build anything different. So he presumably will not have the problem you are taking about. We are trying to do this across the board, but again it is partly a training problem and partly a people problem. You have to have very sophisticated and well trained program managers because they need to understand in detail what they are dealing with.

In my judgment we just have to do a better job of getting the right people in these jobs and keeping them there.

PERSONNEL CONSIDERATIONS IN HIGH-TECHNOLOGY PROGRAMS

Senator ANDREWS. You mentioned people problems and that is another problem. It is not with your estimators and your designers and R. & D. people, but these new contraptions have to go out in the field and have to be manned by petty officers or overseers of American manpower or American womanpower out in the field.

Do we have any knowledge that we are going to have the type of individual in the armed services that can handle these things a decade hence? Everything that has been told by the people in charge of recruiting and personnel is that the individuals coming into the service are those who are less potentially skilled than they would like to see. What type of an R. & D. program have you been doing on the personnel to man these weapons systems?

Mr. CANN. Let me make one comment and then Admiral Monroe who has been very heavily involved in operations test and evaluation has a comment to make.

Standardization is one thing that we are paying a lot of attention to, and we are trying to pay attention to it in a number of ways. One of the most important things we can do is standardize wherever possible on specific pieces of hardware so that we do not proliferate types out there. When you train a sonar technician he will be able to go from one ship to another and be familiar with what he is going to operate instead of always seeing something different.

We have done this to a very high degree and we are doing it on most of the ships going to sea that will have the advance signal processors. In addition to that there is another benefit of the digital technology business that is going on. We are very carefully trying to get a certain number of functions on what we call a printed circuit card, and design the card to have only a finite set of functions so that the built-in test equipment will tell the operator when he has a problem. These cards are relatively inexpensive to replace, and you won't have guys running all over the ship with meters trying to find the problem. We are paying a tremendous amount of attention to the maintainability issue, and as a matter of fact Admiral Seymour could talk to you a great deal about the tremendous improvement that the F-18 has made in the maintainability business.

PROBLEMS WITH F-18

Senator **Andrews**. Who is the guy who maintains the component of the gadget that accepts the card and gives you the printout of what is automatically right or wrong with it? Isn't that going to add more? If you would let me get into the F-18 on the same question. On the F-18, we have $4.2 billion in the F-18 now, and I am told that there are still some flight tests and modifications of the F-18 in the current level of funding for 1982.

Specifically we would like to know what is the seriousness of the roll rate problems that you have experienced in your flight tests and are you going to try to correct them, and what about the maintainability of the F-18 compared to other Navy fighter aircraft, and what is the experience we have got now on the failure rate and maintenance per man-hour on the F-18, and really that is what you are saying. Are we going to say we are going to produce the F-18 or are we going to continue it in R. & D. and still produce it at this fantastic rate?

Admiral Seymour. Yes, sir. The first question was the roll rate problem and we think we have the roll rate problem solved. It is solved. At low level and high speed, the airplane did not roll as fast as we felt it should in cases of combat where they needed to change their direction of flight very rapidly. We have been working on this problem for a year, and we do have it solved. It has been flight tested four times now in R. & D., and it will be cranked into the production.

Senator **Stevens**. That is a modification right now?

Admiral **Seymour**. Yes.

Senator **Stevens**. And we have some modifications that are under way?

Admiral **Seymour**. Yes, because we had to solve the roll rate problem and we had two accidents last year, we still need some more R. & D. money next year.

ROLL-RATE PROBLEM WITH F-18

Senator **Andrews**. This is what I have been driving at. Why couldn't you know that you had the roll rate problem before you went into production?

Admiral **Seymour**. We did, sir.

Senator **Andrews**. And you went into production not having it solved?

Admiral **Seymour**. Yes, because we made a judgment call that it was better to go ahead and accept the fact. Last year when I took over the Command I talked to Admiral Whittle and I said that I could live with the first 60 to 100 planes that aren't fully totally capable. It will be cheaper for me to but 60 to 100 that may not do everything we want them to do in order to get the production line going. You can't go from a zero production line to a high rate right away very effectively. You are better off to spend 3 years going into a slow, 9 airplanes the first year and 25 the next and 72 the next.

Senator **Andrews**. This has been designed for 10 years?

Admiral **Seymour**. It was chosen in 1975.

Senator **Andrews**. Well, it is 6 years and in all of that period of time the roll rate wasn't solved.

Admiral **Seymour**. We started flying the airplane in 1978, and the roll rate wasn't known to be a significant problem until early 1980.

Senator **Stevens**. We had $42 million and $24 million in the 1982 budget. We can expect even another $82 million in the supplemental on the F-18, but no one has quantified for us, what does that mean in terms of changes in production money?

Admiral **Seymour**. The roll rate problem we expect to be very small as far as changes in terms of production money. We have not changed our estimate significantly for production of the F-18 due to the roll rate problem. What we have done is the initial part of the fix which involved adding about eight layers of composite fiber on the wing to stiffen the wing. The cause of the problem was that the wing is a composite wing and it tended to bend and flex more than we thought it would.

Composites are a relatively new technology, particularly the structural parts of composites. We found in 1978 that this wing tended to flex, so we tried, and the initial fix was, to put some composite layers to stiffen it up. That helped a great deal and essentially solved the problem at high altitudes and medium altitudes except for the 5,000 foot altitude area, and at a very high mach, .9, the transonic range. For a fighter, normally I would have said since this is a fighter, "Don't bother with it. They are not going to be fighting down there."

But the F-18 was chosen to be an attack and fighter airplane and the attack pilots are going to be exactly there—at 5,000 feet and below, and at relatively high speeds. They need to have the roll rate fixed if we can.

Senator **Stevens**. We are not being critical. I am a pilot and most of us are pilots and I couldn't agree with you more. But the problem is, where is the time for identification, and couldn't we have identified it before we put $4.2 billion in the F-18?

Admiral **Seymour**. I don't think we put that much in it.

CONCURRENCY BETWEEN DEVELOPMENT AND PRODUCTION

Admiral **Monroe**. That has been the subject of a number of questions—this idea of why don't we complete development and have it known and fixed and right and working before we start production? The answer is that for most systems, the great majority, maybe 90 percent of the systems that we develop, that is exactly what we do. We complete development and we finish full scale engineering development, and we put it through extensive development testing and operational testing and then we make a production decision.

There are a number of exceptions to this general rule, and these are tailored on a case by case basis. Let me talk about three general types of exceptions.

The first is for ships. You cannot design one ship, and build it, and put it to sea, and test it and then make a decision to go back into production on the other ships of the class. There would be a decade or a decade and a half between your initial decision and the time you decide to commence the follow-on production. It would stretch out the acquisition time to maybe 20 years.

Senator **Stevens**. It is not multiple copy items. We agree with you on that.

Admiral **Monroe**. The second type of exception—where it is not practical operationally, in terms of meeting the threat, and in terms of efficient utilization of a contractor—is for major new aircraft. Admiral Seymour may wish to talk more about this.

In the case of the F-18 we bought 11 test aircraft. These were all funded in program year 2 or 3; that is, we started producing them in year 2 or 3 of the development program. In about program year 5 they started flying; and it then takes maybe 3 or 4 years of testing to get all the bugs worked out.

If you put the contractor on hold after he produced the first 11 test articles, and left him in a hold status for the 4 or 5 years that the aircraft are being finished up, tested, and fixed, you would have an economic impossibility. So in these major aircraft programs we have to overlap production and testing, and we try to do this extremely carefully. We try to keep the production rates very low, as Admiral Seymour said. Finally all of our analyses show us that it is cheaper to do this, and cheaper to buy a few articles that may not be quite right, that are 90 percent or 95 percent right, than to hold off for years and not produce any.

If you costed out a total cost of the program on a schedule where you delayed any production until development was absolutely complete and tested and fixed, you would find it would cost more to do it that way than the way we do it today.

Senator **Stevens**. While we are still in open session I did want to ask General Moore if he wanted to add anything to his statement. I do have one specific question and maybe other members do, too.

We can delay going into closed session. Are you involved in any of these little skirmishes that we have been probing here today?

U.S. MARINE CORPS

STATEMENT OF GENERAL MOORE

General **Moore**. The Marine Corps is very supportive of the F-18 for our replacement aircraft, and we also are very appreciative of the support we have received for our R. & D. programs. As Mr. Cann said, this year we are very anxious to get the shoulder-launched multipurpose assault weapon and other programs funded that will help us with our fire-power. I am already to respond to any questions.

SHOULDER-LAUNCHED MULTIPURPOSE ASSAULT WEAPON

Senator STEVENS. What is your shoulder launched assault weapon?

General MOORE. This is a weapon we have been pursuing which is a shoulder launched multipurpose assault weapon designed to knock out enemy bunkers and targets. One thing I might like to say, right up front that it is not in competition with the Viper. As the members know the Viper is an anti-armor weapon. When we retired the flame thrower, we had no replacement weapon for the individual infantry man. This weapon will give the infantryman a capability against bunkers and urban type target. We have developed a dual-fuse warhead that will take out a bunker with sandbags, and also penetrate cement and masonry-type targets.

Senator STEVENS. We understand there is some problem about it as far as the funding is concerned.

General MOORE. We have asked for $7 million in the 1981 supplemental and $17 million in the 1982 amendment. This would provide us the funding necessary to take it through R. & D. and field it in approximately 15 months after the production decision.

Senator STEVENS. You don't seek any funding for 1982?

General MOORE. In 1982—we would require $17 million in the amendment.

Senator STEVENS. In the amendment?

General MOORE. Yes sir. In the current administration's budget.

Senator STEVENS. And is there any other system that can meet those requirements?

General MOORE. There is no other system currently in existence or under development that meets our requirements. This system exists today. The warhead is developed and the launcher is available and we can have it in our hands in 15 months after the production decision.

Senator STEVENS. How soon could you think you could make a production decision on that?

General MOORE. We would make a production decision in the summer of 1983.

Senator STEVENS. If you made that decision, that is this year?

General MOORE. No, sir, the summer of 1983.

Senator STEVENS. If you made that decision how soon would you have that in the field?

General MOORE. We are estimating between 15 and 18 months.

Senator STEVENS. What is the weight of that?

General MOORE. The warhead itself weighs approximately 10 pounds and the launcher is about 8 pounds, so you are talking about 17 to 18 pounds.

Senator STEVENS. And has it been tested really in the field with troops?

General MOORE. We have conducted tests but not with troops. We have conducted tests which show that it is extremely effective against sandbagged bunkers and masonry type targets.

Senator STEVENS. It sounds like a very interesting addition to your capability. We would like to pursue it.

Are there other items that we ought to specifically know about, General?

PREPARED STATEMENT

General **Moore**. I believe my prepared statement covers most of the areas. Certainly, I will respond to any other questions.

[The statement follows:]

PREPARED STATEMENT OF BRIG. GEN. J. W. MOORE

DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND STUDIES

Mr. Chairman, Members of the Committee:

Thank you for the opportunity to appear before your Committee to explain the Marine Corps' Research and Development (R&D) programs for Fiscal Year 1982.

BUDGET REQUEST FOR FISCAL YEAR 1982

The Marine Corps Research, Development, Test and Evaluation (RDT&E) Budget Request for Fiscal Year 1982 is $189.3 million. This amount is 3% of the Department of the Navy RDT&E request for Fiscal Year 1982. The Marine Corps' share of the Navy's budget does not include funds for the development of aircraft for Marine aviation, such as the AV8B and CH53E. Marine aviation is an integral part of Naval aviation and is funded by the Navy.

MARINE CORPS R&D PURPOSE

The purpose of the Marine Corps R&D Program is to develop, assist in developing, and acquire operational systems to enable the Fleet Marine Force to accomplish its amphibious assault mission, rapid deployment force tasking, and any other mission the President might assign.

MARINE CORPS R&D STRATEGY

Because of limited funding, the Marine Corps R&D strategy emphasizes the acquisition of operational capabilities which minimize high-risk exploration, extensive development, and unilateral acquisitions. Our strategy focuses on exploiting low-risk, state-of-the-art technology; extending the life span of existing equipment with improvements; participating in other Services' buys when the weapons or equipment they have developed meet our operational needs; and joining in the developmental efforts of other Services to influence the design characteristics and performance capabilities of the end product so that our unique requirements will be met. We resort to unilateral development only when the requirements to be met are peculiar to amphibious warfare for which the Marine Corps has primary responsibility.

OBJECTIVES OF MARINE CORPS R&D

Our R&D objectives are aimed at the development or acquisition of combat capabilities which will provide us with the means to accomplish our amphibious assault and rapid deployment force mission. Our goal is to enhance the fighting capability of the Marine infantryman. This includes getting him ashore most expeditiously, enabling him to maneuver, and supporting him as effectively as possible with coordinated, timely and accurate fire.

MARINE CORPS PROGRAMS

Today, I plan to discuss some of our more important programs which are representative of the type of capabilities we are developing to increase the fighting Marine's combat effectiveness by improving his ability to move from ship-to-shore; his mobility and firepower once ashore; command, control, and communications; fire support; and logistic support. I will also address a Navy program that is of particular interest to the Marine Corps.

AMPHIBIOUS ASSAULT WARFARE
LANDING VEHICLE TRACKED (LVT7A1) PROGRAM

The most important Marine Corps program is the one concerned with the development of our amphibious assault vehicles. For the execution of the surface assault, the Marine Corps is now using the Landing Vehicle Tracked (LVT7). This vehicle was introduced into the Fleet Marine Force in 1972 with a planned life-span of ten years. The LVT7A1 program is a service-life extension effort to upgrade the present LVT7s with state-of-the-art improvements required to fill the gap during the years 1982-1990. Some of the more significant improvements are: a new engine and transmission, the addition of secure voice communications, night driving capability, a more efficient ventilation system for the troop and engine compartments, better fire protection, and improved reliability and maintainability.

LANDING VEHICLE TRACKED (EXPERIMENTAL) (LVT(X))

The follow-on vehicle to the LVT7A1, the LVT(X), is presently in the conceptual stage of development and is projected to be operational in 1990. The design of the LVT(X) will not only emphasize mobility in the ship-to-shore movement, but also emphasize improved fighting vehicle characteristics to enhance its land warfare capabilities in subsequent operations ashore. The LVT(X) will have significantly improved cross-country mobility and agility, troop protection, lower silhouette, and considerably improved firepower.

MOBILE PROTECTED WEAPONS SYSTEM (MPWS)

Presently, in the conduct of the helicopterborne assault in amphibious operations, our assault forces land without a highly maneuverable, direct-fire support, mobile, protected weapons system for employment against armored forces. The excessive weight of our tanks preclude their use in other than surface assault operations. To correct this deficiency the Marine Corps is pursuing the development of the MPWS with an initial operational capability in the late 1980's. The MPWS will be helicopter-transportable, agile, and lethal against materiel, armor and personnel targets.

Our acquisition strategy provides for a dual approach. One approach is oriented towards the development of an MPWS from a conceptual design and would provide an Initial Operational Capability (IOC) in 1988. The other approach is predicated on the use of an existing hybrid vehicle that can be adapted to meet our operational requirements and provide an earlier IOC of 1986. The Marine Corps will decide whether to pursue the MPWS development via a conceptual or hybrid design at a Marine Corps Systems Acquisition Review Council (MSARC) I which is scheduled during mid FY82.

LIGHT ARMORED VEHICLE (LAV)

The Marine Corps has an urgent requirement to rapidly field a family of light armored vehicles (LAVs) to provide not only fire support, but also tactical mobility for the maneuver elements to combat the continually increasing mobility and firepower of threat forces. The LAV acquisition strategy is directed toward the procurement of modified off-the-shelf armored vehicles/weapon systems which, based upon the use of a common chassis, have the potential to be developed into a family of mission variants. Procurement of candidate test vehicles will commence in FY81 with a procurement decision expected during FY82. By the use of off-the-shelf LAVs, the Marine Corps will be able to attain an Initial Operational Capability (IOC) of 1983. With this capability, the Marine Corps will be able to increase the firepower and mobility of their helicopter lifted maneuver elements.

COMMAND, CONTROL AND COMMUNICATIONS

TACTICAL AIR OPERATIONS CENTRAL (TAOC) - 85

In the Fleet Marine Force, the air element of the Marine air-ground team plays a significant role in the seizure of the landing force objectives. The effectiveness of air support is measured in terms of its responsivness to the needs of the ground element. This can be achieved by an air command and control system that has the capability to provide the tactical air commander with the timely information he needs to make operational decisions. The existing Marine Air Command and Control System is based on operational concepts and technology of the 1950s/1960s. By 1985, it will be worn out, logistically unsupportable, and incapable of meeting the demands inherent in the air command and control functions. The Marine Corps is pursuing the development of the TAOC-85 as a replacement for the present system. The TAOC-85 will incorporate current technology displays, computers, and communications means necessary to effectively counter the future threat. The TAOC-85 will make maximum use of off-the-shelf equipment that can interface with that of the other Services and NATO forces. It will have the requisite mobility and flexibility for movement by helicopter and will provide the level of support commensurate with the size of the supported unit and the intensity of the air threat.

MARINE INTEGRATED FIRE AND AIR SUPPORT SYSTEM (MIFASS)

For the ground element of the Marine air-ground team we are developing the MIFASS with which we can orchestrate the control, coordination, and delivery of mortar, artillery, naval gunfire, and close air support. It will be automated, lightweight and provide real-time information. The MIFASS will interface with other command and control systems, such as the TAOC-85. It is a unilateral Marine Corps development only because no other system, either existing or in development, can integrate the control and coordination of all supporting fires. The initial operational capability for MIFASS is 1986.

UNIT LEVEL SWITCH (ULS)

In communications, the Marine Corps is still utilizing unsecure telephone switching systems. The projected level of combat intensity in the future demands a more responsive telephone switching system. Under the Joint Tactical Communications (TRITAC) Program, the Marine Corps has been assigned the responsibilty to develop a family of unit level switches for all the Services. The ULS program consists of three discrete development efforts: A message switch for the secure transfer of digital data, and two circuit (or telephone) switches to move and switch voice or telephone traffic securely. The initial operational capability for the switches is 1986.

POSITION LOCATION REPORTING SYSTEM (PLRS)

In combat, the ability to pinpoint the location of friendly forces in the air and on the ground is essential for command and control and for the rapid and safe delivery of supporting fires. For these reasons the Marine Corps, is jointly developing the PLRS with the Army. PLRS will provide accurate location of friendly units, both air and ground, without voice communications. Besides generating precise real-time position information, PLRS provides zone avoidance and bearing/range to other unit locations as well as corridor guidance and navigation to airborne users. Because of these capabilities PLRS will greatly enhance the effectiveness of tactical command and control systems, such as the TAOC-85 and MIFASS, which have been previously discussed.

FIRE SUPPORT

MODULAR UNIVERSAL LASER EQUIPMENT (MULE)

The delivery of effective supporting fire is dependent upon the proficiency of the controlling agencies in providing target location information and accurate ballistic solutions. The Marine Corps is developing a precision ground laser rangefinder and designator, the MULE, which is man-portable and functionally modular for use by our forward observers in the delivery of laser-guided munitions. The introduction of precision-guided laser munitions, such as laser-guided bombs, Laser Maverick, and Copperhead (the cannon-launched guided projectile), will enable the forward observer to achieve first-round hits against stationary and mobile targets. Using the MULE, the forward observers can also determine the range and azimuth to the target for conventional artillery, naval gunfire and air support, thereby significantly improving weapon effectiveness. The MULE initial operational capability is 1984.

FIELD LOGISTICS SYSTEM (FLS)

Faced with an insufficient amount of Navy amphibious shipping, the Marine Corps is emphasizing the development of equipment which is compatible with commercial as well as amphibious ships. Our FLS development emphasizes dimensional standardization of logistic support equipment which optimizes inter-modal transport capability.

The FLS consists of: (1) a Container System that in conjunction with commercial containers, will be used for the marshalling, transporting, and warehousing of equipment and supplies; (2) an Expeditionary Shelter System, also dimensionally standardized, that can be erected in configurations to meet the need for housing sophisticated equipment, life support, maintenance, and supply operations; (3) a Combat Service Support capability that will provide services such as electric power, water purification, and field sanitation; and (4) a modernized Tactical Motor Transport vehicle fleet that provides overland mobility for service and combat support elements.

SMALL ARMS

One of our primary concerns is to materially improve the capability of the Marine on the ground who must defeat the enemy in close combat. To achieve this the Marine Corps is participating with the other Services in the Joint Services Small Arms Program (JSSAP) to develop and sustain a long-term, coordinated, small-arms development program. This effort is oriented to developing new or improved capabilities in rifles, machineguns, grenade launchers and laser rangefinder sights.

AMPHIBIOUS CRAFT AND SHIP

LANDING CRAFT AIR CUSHION (LCAC)

Earlier I mentioned I would discuss a Navy program of great interest to the Marine Corps. This program is the LCAC. The LCAC is of major importance to the Marine Corps because of its high speed, heavy load-carrying capability and the flexibility it provides the task force commander. In the ship-to-shore movement it may be utilized to transport tanks, artillery, and engineer equipment as well as troops. Because the LCAC rides on a cushion of air over the water, it has significantly increased the number of beaches worldwide where amphibious assault forces can be landed. Due to its speed and range, the LCAC increases the stand-off distance from shore from which the landing force can launch. Moreover, its ability to move across the beach eliminates congestion at the water's edge and enhances troop survivability. The LCAC will be transported to the amphibious objective area by the Landing Ship Dock (LSD-41); the LSD-41 also accommodates our amphibious assault vehicles and other combat essential equipment. Together, the LSD-41 and LCAC greatly enhance the amphibious assault capability of your Navy and Marine Corps team.

CONCLUSION

In this statement I have only discussed the major programs that are of great value to the Marine Corps. I have left out other Marine Corps programs which, although small, are essential to the accomplishment of our missions. The Marine Corps' relatively limited budget request of $189.3 million for Fiscal Year 1982 will be prudently spent for the programs that I have described and for brevity, others that I have not described; it provides the Marine Corps a capability that is required to continue serving as this Nation's force-in-readiness and unique instrument of national strategy.

Mr. Chairman, we thank you for the opportunity to explain our programs before your committee. We request your continued support.

RECESS TO EXECUTIVE SESSION

Senator STENNIS. I have no questions now, and I am pleased to attent the hearing.

Senator STEVENS. I am happy that you are with us, my friend. As I indicated there are some items we do want to go into in closed session.

[Whereupon, at 9:30 a.m., the subcommittee recessed and convened in executive session.]

Executive Session

The subcommittee met at 9:30 a.m., in executive session in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, Andrews, Rudman, and Stennis.

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE NAVY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

STATEMENT OF GERALD A. CANN, ACTING ASSISTANT SECRETARY OF THE NAVY (RESEARCH, ENGINEERING AND SYSTEMS) (Resumed)

STATUS OF STRATEGIC PROGRAMS

Senator STEVENS. We will come to order. Senator Rudman, you had a question and you indicated you might have some items to ask about.

In your testimony on page 13 you described some strategic matters. Could you tell us if you can where we are at with regard to the Trident II and the strategic programs there?

Mr. CANN. The whole thesis of our strategic missile program right now is to preserve a decision option. This option will be decided at a Milestone II DSARC at the end of fiscal year 1983. What we are in the process of doing is completing the accuracy program which has been ongoing for some 3 or 4 years, which has been quite successful. We are doing the necessary work to preserve two options which is to be able to go forward with what is called the D-5 missile which is carrying significantly more and larger warheads, and preserve the option to just go through an accuracy improvement program for the Trident I.

That decision is one that we have been asked to maintain by the Secretary of Defense in February. That is what the money is for, to preserve that option.

ELF PROGRAM

Senator STEVENS. Where are we now with regard to our submarines and shore communications systems?

Mr. CANN. You mean with respect to ELF?

Senator STEVENS. That is another question. Is there something classified about the decision to shelve ELF?

Mr. CANN. No, sir. The current decision is to continue the ELF program, dealing with the test facility and proceed with making that an operational system. At the same time the Secretary of Defense has just initiated a total strategic connectivity study to look at not only submarine communications but to look at the communications for aircraft and in all strategic systems.

Senator **Stevens**. I had understood we were going to have a final recommendation to the President on the whole system by mid-August and the President to submit it to us by September 1, is that right?

Mr. **Cann**. Yes, sir.

Senator **Stevens**. We are asked to fund this in the meantime. Our bill will be out before that decision reaches us.

Mr. **Cann**. The President has indicated he wants to continue the ELF program, using what has been known as the Wisconsin site. We will start to develop the receiver to go in the submarines and to bring the transmitter a state where it can be used operationally.

Senator **Stevens**. Again my question is, Is there anything about that that is classified?

Mr. **Cann**. The fact that that is going to be done?

Senator **Stevens**. The whole system, as far as ELF?

Mr. **Cann**. The things that are classified on ELF are data rates and coverage and depths at which the submarines can receive.

Senator **Stevens**. But in terms of modifications of ELF that we don't know about that led to that decision, or is there a change of decision?

Mr. **Cann**. There was a recommendation made by the Chief of Naval Operations through the Secretary to terminate ELF.

Senator **Stevens**. That is what I was led to believe.

Mr. **Cann**. And subsequently that was reviewed and discussed at the Secretary of Defense level and the decision was made to continue the program.

Senator **Stevens**. It was made to review the report and to make a report to Congress by September. Isn't that right?

Mr. **Cann**. It was recommended putting the ELF in a caretaker status.

Senator **Stevens**. But I don't know why it was reversed. I understood you were going to put it on the shelf and the next thing that we heard was there would be a decision in August and they will report to us. If it is going to be put on the shelf, that is one thing. We wouldn't fund it, would we?

Admiral **Seymour**. The CNO recommended we would put it in a caretaker status and his recommendation was not accepted by the Defense Department essentially, and then there is, in addition to it, a strategic study that is to be conducted between now and August for the President that covers the whole thing.

FUNDING LEVEL OF ELF

Senator **Stevens**. The funding level is being put 34.8 and there is not going to be any additional until that decision in September, is that correct?

Admiral **Miller**. 34.8 is right.

Senator **Stevens**. And we are not going to do anything until we get the recommendation to the Congress.

Admiral **Miller**. That is right.

Senator **Rudman**. On that point, do you presently have underway in your shop and other communication systems, feasibility studies or concepts, that may in fact supplant ELF or be superior to ELF? I say that with the knowledge of the enormous communications problems that we have with our submarines.

Mr. CANN. ELF does one special thing. It permits the communication at very low data rates with submarines that are at sea and submerged. There is nothing being done with one exception that could possibly supplant that capability to communicate at depth at low data rates. There is a program going on at ARPA called the blue-green laser project. We have a joint agreement with them to support it. That is a very advanced development program and it will take at least a decade to bring that to the point where you would be able to consider it for deployment.

SURFACE MISSILE WARHEAD

Senator STEVENS. What about the surface missile warhead? Can you tell us where you are now? I notice on 23 you have a statement about the need for your surface-to-air missile, the nuclear missile.

Admiral MONROE. For about 5 years the Navy has been desirous of developing a surface-for-air nuclear warhead for standard missile to replace the nuclear Talos missile, which is now gone from the fleet, [deleted].

[Deleted.]

Approval for development of this nuclear warhead has been delayed for 3 to 4 years by the Secretary of Defense while a number of reviews were carried out, first by the Navy then two reviews by the Office of the Secretary of Defense—one by the research and engineering side and one by the policy side—then a final one by the Defense Science Board. The review by the Defense Science Board coupled with all the others, finally convinced former Secretary of Defense Harold Brown that the Navy did in fact need this nuclear missile, and he approved development of the warhead.

Unfortunately this approval came just too late to get the warhead in the original fiscal 1982 budget or to save the money that the Congress had put in the budget for fiscal years 1979 and 1980, which had not been spent. As a result, the new administration immediately put development of this nuclear surface-to-air missile warhead as a high priority item in both the fiscal year 1981 supplemental and the fiscal year 1982 amendment. I think it is $4 million in 1981 and $14 million in 1982. The Navy very strongly supports this.

We believe it gives both deterrence against the onset of nuclear war at sea, which we would very much like to achieve—and a significantly increased level of capability and beyond in fleet air defense—and conventional war capability.

Senator STEVENS. I agree. If we had that now we wouldn't have some of the problems about the battleships. What is the time frame for that?

Admiral MONROE. I think the IOC is about [deleted] with the requested fiscal 1981 and 1982 funding.

Senator STEVENS. Do you have any estimate of how much we are going to have in terms of this R. & D. functioning as far as this new missile is concerned?

Admiral MONROE. You mean the cost?

Senator STEVENS. What is it going to cost us to get to the decision of whether we can do that?

SM-2 WARHEAD

Admiral **MONROE**. I will provide it for the record. It is on the order of $100 million in the Navy budget and something equivalent in the Department of Energy budget, to do the complete development.

[The information follows:]

SM-2 WARHEAD

The Navy costs to complete RDT&E and system integration planning are estimated at $94 M. The Department of Energy costs to complete the warhead design, ground tests, and flight tests are estimated at $60 M.

PROBLEMS IN TRIDENT SHIP PROGRAM

Senator **STENNIS**. You mentioned, Mr. Chairman, the Trident. I don't want to go back into all of the facts this year about the Trident, but the Senate Armed Services Committee has left it out of the bill.

Senator **STEVENS**. That is acquisition or their R. & D.?

Senator **STENNIS**. It is not R. & D. but I want to ask how it relates. I am very much disturbed about the lateness of the Trident. Without going into the reasons for that now, it leaves the committees here carrying all of the load of our taking this money out. The Trident, you know, they say it is a part of the Triad, and now the third leg. Could you from your standpoint have R. & D., or could you throw any light on that situation? What are you expecting in your field with reference to the Trident moving forward?

Mr. **CANN**. You mean the Trident ship?

Senator **STENNIS**. Yes, the whole thing.

Mr. **CANN**. I really would have to say I am just not in a position to give you what I feel is a competent answer on that. I haven't followed it at all.

Senator **STENNIS**. That is all right. Anything that would reflect light on the problem is helpful.

Admiral **MILLER**. You are talking about the 10th ship at this point. The problem we are having is in the first ship and certainly we can expect that by the time we get to the 10th ship we are going to have these problems in R. & D. and the problems in the actual construction ironed out and we are seeing improvements all of the time.

Senator **STENNIS**. In vessels, I would concur in that.

Admiral **MILLER**. The learning curve is going to correct that problem.

Senator **STENNIS**. So you are not concerned particularly about it. At your doorstep you don't have any problems?

Admiral **MILLER**. We are concerned that it was cut out. We are not concerned that we can't correct the problem by the time we get to the 10th ship.

Senator **STEVENS**. It was cut out of the Armed Services budget?

Senator **STENNIS**. It was eliminated.

BLUE-GREEN LASER PROGRAM

Senator **Stevens**. What about the blue-green laser? Have you requested any additional moneys for that in the supplemental? That is your project.

Mr. **Cann**. It is the Defense Advanced Research Projects Agency's project.

Senator **Stevens**. Are you involved in it?

Mr. **Cann**. We have a joint agreement with them to support their activities.

Senator **Stevens**. Are you providing any funds to support it?

Mr. **Cann**. I will have to supply that for the record.

[The information follows:]

Blue-Green Laser

In Electron Device Technology, we have $800 thousand in our present program which supports the DARPA Space Experiment planned for fiscal year 1986. Additionally, we are providing $371 thousand to support this year's airborne experiment for which DARPA is the lead agent.

ADDITIONAL FUNDS FOR BLUE-GREEN LASER

Senator **Stevens**. We were told that there was probably a need for another $8 million for the Navy to accomplish its function with regard to blue-green laser. I would like to know if that is the case.

Mr. **Cann**. I will find out. I don't know that.

Senator **Stevens**. You don't have any recollection of asking money for that and having it be denied as we went through this amendment process, after the administration came in?

Mr. **Cann**. No.

Senator **Stevens**. I would like to have any information on that, an update on that.

Mr. **Cann**. It is a very exploratory effort.

Senator **Stevens**. But it has great promise.

Mr. **Cann**. I will have to get the facts for the record. As far as I know, our effort is funded and they are carrying the bulk of the effort. We have a support agreement with them, which I believe is fully funded but I will find out.

Senator **Stevens**. We will be glad to consider additional moneys if they are left out.

[The information follows:]

Blue-Green Laser

I have never heard that figure. DARPA would like the Navy to provide approximately $190 million between now and fiscal year 1987 in order to accomplish the program as planned and to make the Navy an equal partner with them. However, these dollars are not identified in Navy programs at the present. The Navy continues to have an interest in blue-green for several potential applications. It may be used for communications, either tactical or strategic. But the blue-green spectrum is the only window in the ocean which supports the transmission of light. Therefore, the Navy will continue to support this technology base area. Our fiscal year 1981 support to the DARPA program is funded at the jointly agreed level.

CRUISE MISSILES

Senator **Rudman**. I have a question on another subject. The film indicated the firing of the air-to-surface and surface-to-surface Harpoon and Tomahawk. What is the guidance system?

Mr. CANN. It is radar.

Senator RUDMAN. Is it directed within the missile as well?

Mr. CANN. Yes.

Senator RUDMAN. There is acquisition radar?

Mr. CANN. You shoot down a bearing line with the Harpoon, and it searches down the bearing line.

ELECTRONIC COUNTER MEASURES AGAINST MISSILES

Senator RUDMAN. Do we presently in our fleet on our surface vessels have ECM against those missiles? Do we have ECM on our vessels at sea today that will defend against those missiles?

Mr. CANN. I will let Admiral Monroe, answer that.

Admiral MONROE. In the world of ECM I wold hesitate to use the word "effective," because it is a measure-countermeasure chess game. We have an ECM system that has significant capability against, enemy antiship missiles. It is the SLQ-32, a threat reactive system, and its effectiveness depends significantly on how it is employed operationally. [Deleted] What the SLQ-32 would do against enemy missiles fired at us is [deleted] alert the ship [deleted.] This enables the ship to engage it with guns, like the close-in weapons system; or with missiles, like the standard missile [deleted] depending upon the skill of the operational commanders.

Senator RUDMAN. Is that a multithreat ECM system?

Admiral MONROE. Yes, it is.

Senator RUDMAN. And what is the approximate range of those missiles?

Admiral MONROE. You mean, of Harpoon?

Senator RUDMAN. Yes.

Admiral MONROE. Today about 60 miles if launched from a ship or submarine, and [deleted] launched from an aircraft. In about 1982 we are going to change the fuel in all these missiles [deleted.]

ECM FOR BATTLESHIPS

Senator RUDMAN. Coming back to Senator Steven's major concern on these battleships, what thought has been given to including within your proposal to this committee very sophisticated ECM for those battleships, some of which are under development in this country. I was briefed on it last week.

Admiral MONROE. The SLQ-32 is planned for installation on the battleships—should that program be approved by the Congress—as are the close-in weapons system which give a capability to engage missiles.

Senator RUDMAN. What field testing has been accomplished with the SLQ-32 similar to the Soviets missiles which would be surface-to-surface missiles?

Admiral MONROE. An immense amount. We do that testing [deleted.]

Senator RUDMAN. Who manufactures the SLQ? I want to make sure I have the right system in mind.

Admiral MONROE. Raytheon.

Senator RUDMAN. I think it would be very helpful to this subcommittee if when we do this, and the reason I am speaking to you about this is because this is more within your area than the people coming to us on the battleship programs, to give us a very thorough orientation on the ECM, its capability, its probability, its threat resistance and so forth, if we are going to be talking about their procurement program.

Our major concern is the survivability of these ships, and not only survivability but whether they can complete their mission after coming under attack by a Soviet missile like the Tomahawk. We ought to know a great deal about the possibilities that are being proposed so we can make an evaluation. That could change my mind, and right now I am teetering as far as these battleships are concerned, so I think that is a very important part of a presentation that you are going to make to us.

Mr. CANN. There is one other point; the battleships would be operating in concert with a battle group. Of course, in the same sense that the carrier is protected by Aegis ships, the battleship would be protected by these ships and it would be placed in a formation in such a way that it would come under the umbrella of the two to four Aegis ships.

Senator RUDMAN. It is my understanding that under some of the more advanced narrow band tracking systems that could be installed in missiles, which we have to assume the Soviets will have at some time in the decade, it is essential that each ship be equipped with its own effective multithreat system.

Mr. CANN. Absolutely.

Senator RUDMAN. And I would like to know more about that and I am very interested in that.

Senator STEVENS. That is the timing and why the timing on the R. & D. and the nuclear capability is so essential.

Mr. CANN. I think what we would like to do on an individual basis or a joint basis is to give an indepth review of the whole concept of AAW defense because it is a defense in depth notion. You have to attrite some of the aircraft and some of the missiles before they get in close. The systems we are talking about on many of our ships are self defense systems for missiles that come through the air-to-air systems.

Senator STEVENS. The threat here does not even depend upon air launch and it is really a land based target. We are talking about some rather fantastic accuracy coming out of these missiles now. I agree with Senator Rudman, we have to assume that they are developing the same capability that we are.

Mr. CANN. We will give you that.

[The information follows.]

BATTLESHIP ELECTRONIC WARFARE SUITE

The planned battleship EW suite consists of two closely interrelated subsystems, the AN/SLQ-32(V)3 System and the MK 36 Decoy Launch System.

The AN/SLQ-32(V)3 System detects and counters enemy anti-ship missiles [deleted] to provide targeting data. An Operational Test and Evaluation Force Report of 6 February 1981 stated that the system detected and correctly identified [deleted] simulators flown against it during tests. These simulators reproduce, as accurately as possible, the electronic signatures and in-flight characteristics of enemy anti-ship missiles. Ability of the SLQ-32 to cause the simulators to miss their targets [deleted]. As an ancillary function, the system found aboard enemy ships, submarines, and aircraft. During tests, [deleted].

The MK-36 Decoy Launch System includes six separate mortar-type launchers strategically placed about the ship to provide 360 degrees of coverage. Each launcher has six barrels, [deleted]. To facilitate replenishment, each launcher has an adjacent ready-service locker [deleted].

A single-ship engagement of enemy anti-ship missiles, from an electronic warfare point of view, could proceed as follows. The AN/SLQ-32(V)3 continuously searches the electromagnetic spectrum throughout 360 degrees. Upon detection, a signal is analyzed [deleted].

Alerting information, is provided to "hard-kill" weapons systems. An electronic warfare specialist monitors an operator's display and control console, ready to [deleted] at the tactically correct time.

A multi-ship missile engagement scenario would vary from the above in that assets would be employed in such a manner as to capitalize upon the synergistic effect which results when numerous EW suites are used in mutual support.

Winning a sea battle against an enemy employing anti-ship missiles is a complex endeavor. The officer in tactical command (OTC) has a vast array of assets, including battleships, which must be correctly employed to ensure victory while enhancing the probabilities of survival of friendly ships. Intelligence reports and early warning aircraft would provide the OTC with information concerning the enemy's location, disposition, and intentions. Friendly strike and fighter aircraft, surface ships, and submarines would attack and disable enemy missile-launching platforms. Enemy airborne missiles would be attacked and attrited [deleted]. Simultaneously, throughout the engagement, EW equipment would, in conjunction with friendly radars, detect and identify enemy platforms and missiles, [deleted].

In summary, there is no guarantee that any weapons system will ensure that a ship will survive an anti-ship missile engagement. An OTC must have available a broad range of assets which will, if employed in a tactically correct manner, greatly enhance the probabilities of victory and ships' survival.

BATTLESHIP CAPABILITY

General MOORE. From the offensive standpoint, and it goes back to sea control and power projection, the capability that the battleship provides; the capability that we can get in the near term, we can present a presence and project our forces into various oceans and provides needed support for our amphibious operations. I think we are all very familiar with our naval gunfire requirement and certainly on behalf of the Marine Corps, we support the battleships offensive function, to give us the capability that we certainly are lacking today.

Senator STEVENS. You have that capability without those battleships, General.

General MOORE. The battleships will enhance any capability we have.

Senator STEVENS. If you have any kind of rapid deployment force, that battleship is going to be a little late. Many of us are thinking about the rapid deployment concept and how we can augment your capability to be there and be there quickly and so the world will know you can get there quickly. Don't misunderstand me, I think we all love battleships, but I love the 1932 Pierce Arrow, too. We are trying to help you modernize and I think some of us are being misunderstood.

As someone said, I would help them get the money for 10 new ships including the Tridents as opposed to one battleship. It is just a question of modernization.

Admiral MONROE. The point the General was making is if you have to fight your way ashore, a rapid deplolyment force by itself would not get you ashore against a determined enemy and a well defended beachhead. We have to apply the lessons we learned all throughout World War II, as you know, having gone across defended beachheads. The 16-inch guns of this battleship represent one capability of the old ship that we can well use in the future.

Most capabilities of the reactivated battleship we are talking about are new capabilities, achieved through installation of modern weapons systems; but one of the residuals is the one the General mentioned, for which we have no substitute today.

Senator STEVENS. If we were going to war we would not have the problem, and again I agree with Senator Rudman. I am convinced this is the right course to go, and it just hasn't happened yet. I think we have some others who came to me and told me they just think that was a decision that we should not live with.

ADVANCED IDENTIFICATION TECHNOLOGY

I will go to one other thing and that is advanced technology. You have that classified also here, and with several other developments that show promise of being partial solutions to the identification problem. What is our expectation there and tell us how much money is committed in there and what we can see in terms of commitment to that project? Again I think it is a very necessary function if we can increase that identification technology or improve it. It would be a great thing.

Admiral SEYMOUR. Let me address one that we have under way now, the noncooperative target recognition. This is designed, basically as software, using radar signal processing in the airplane or in its computer whereby the crew can recognize what kind of an engine it is looking at. [Deleted.]

[Deleted.] This is one technology. [Deleted.]

That is one where I would say it is in full scale development. We are planning to put the software into production, to go into the F-14's. There are other techniques that may be in exploratory development, which I can't address because I don't know if any of them are funded. There are a variety of other techniques that I am sure we have looked at in the past. Some may be addressed in the future but I am not aware of any.

Senator STEVENS. Are any of these going to increase the distance for identification?

Admiral SEYMOUR. It will significantly increase the distance for noncooperative target recognition. We use this term because what we have used in the past and what you are familiar with, is called identification of friend, foe, or neutral. This is essentially a cooperative system. If he—the unknown aircraft—does not have his transponder on, we interrogate him and say he must be an enemy, and if he is a friend of course, he sends back the proper signal. [Deleted.]

There are ways to counter that. [Deleted.]

[Deleted.]

We are doing some things with surface radars, air-to-surface radars, where we can classify an object, normally a ship, [deleted]. In the air-to-air world [deleted]. [Deleted] is the only one that I am aware of that is ongoing and we are very optimistic about it.

Senator STENNIS. I want to make an observation. I brought up this matter about the Trident which was a matter of concern. I don't think that bill and report have yet been filed. This is a closed session, and I want what I brought up about it to be strictly off the record, and let the bill and report speak for themselves without talking about it now. It is covered in such a way as still being an open question.

Senator STEVENS. We thank you very much.

MARK-48 TORPEDO

Mr. CANN. One point I would like to make is that the House Appropriations Committee in the mark-up of the supplemental reduced by $5 million the Mark-48 torpedo, and I would like to just point out for the record that the Mark-48 torpedo is our only nonnuclear weapon that the submarine force is using. When we became aware of several very important technical concerns associated with Soviet submarines, we embarked [deleted] to offset the demonstrated speed of the Alpa submarines; and the projected but unproven depth capability.

We had a very aggresive program which we decided to accelerate, and with it came increased costs. We have asked for these increased funds in the fiscal year 1981 supplemental and $5.0 million was deleted from the request. We consider it to be a very high priority program.

Senator STEVENS. We are going into each one of those reductions on the House side to make sure that those are our interest items as far as that is concerned. We will look into that and we appreciate your statement.

I do have a series of questions, some of which we would submit for the record. We would appreciate it if you could cover your area.

F-18 PROGRAM

Admiral SEYMOUR. I can finish answering the questions on the F-18 either on the record or now. You asked me three questions and I partially answered the first one. You asked about maintainability the reliability and the cost of the roll rate.

ROLL RATE COSTS

Senator Stevens. Would you put those in the record? We have one other item we have to cover and then I have to be over there by 10:30.

[The information follows:]

F-18

Roll Rate: During flight tests in calendar year 1980, it was discovered that the low aircraft roll rate was due to greater than predicted wing deflection and aero damping at high dynamic pressures. The corrective action includes increased wing stiffness (adding several layers of graphite fibers), increased aileron area (extending the aileron on the outer wing panel to the wing tip), limited trailing edge flap deflection (8° travel up and down), and differential leading edge flaps. With these fixes incorporated, roll performance, both steady state and angle-of-bank in one second, has met requirements. Although the problem was discovered in calendar year 1980, the cost of designing, incorporating and testing the roll rate fix could not be fully determined until after the initial R&D budget for fiscal year 1982 had been formulated and submitted to Congress. The F/A-18 Research and Development program is funded on an expenditure basis and, as significant problems occur in the program, budget shortfalls are generated. For this reason, the Navy requested additional funding in the FY 1981 supplemental and in the FY 1982 amended budget and needs an additional $51.5M over those requests.

Reliability and Maintainability (R&M): F/A-18 design has emphasized designed-in reliability and maintainability features throughout the development process. The contract was heavily incentivized for R&M and the maximum objective was achieved for all but two R&M objectives and those were near the maximum. At the 2,500 cumulative flight hour point, aircraft reliability was 2.38 mean flight hours between failures with the threshold at 1.4 mean flight hours between failures. The results for only the most recent 200 flight hours is 4.0 mean flight hours between failures. The formal 100-flight hour/50-flight demonstration yielded 8.4 mean flight hours between failures while our present fleet aircraft are achieving about 1.0 mean flight hours between failures. Maintainability parameters at the 2,500-hour milestone, based on a six-month moving average, are: direct maintenance man hours per flight hour—6.36; organization level, unscheduled maintenance man hours—3.62. Initial Operational Test and Evaluation results compared favorably with Full-Scale Development experience, with 2.37 mean flight hours between failures and 9.7 direct maintenance man hours per flight hour. The differences primarily are due to the transition from experienced contractor maintenance personnel to Navy organic maintenance. This gives a projection in the fleet of only 17 direct maintenance man hours per flight hour for the F/A-18, compared to 23 for the A-7, 32 for the F-4 and 49 for the F-14.

OPEN SESSION

[Whereupon, at 10 am, the executive session concluded and the subcommittee reconvened in open session.]

SUBMITTED QUESTIONS

Senator STEVENS. The subcommittee has a list of submitted questions from Senators Hatfield, Stennis, and myself which we will submit for your response.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

QUESTIONS SUBMITTED BY SENATOR STEVENS

MULTI-YEAR PROCUREMENT

Senator Stevens: Please comment on how large of an impact a shift toward multi-year procurement would have on Navy RDT&E and production plans. What kinds of Navy programs would be most amenable to multi-year procurements in the near term?

Mr. Cann: The use of multi-year procurement would impact only the procurement accounts at this time. This type of contracting is anticipated to reduce costs but, more importantly, should improve the quality of the hardware and the efficiency of the production lines. Program selection criteria will include a risk assessment of the design, testing results, planned changes to the design, procurement quantity plans, and the need for improved production facility. Candidate programs from a cost savings viewpoint are currently being reviewed as a part of the budget process for FY 1983. Cost savings for FY 1983 could be as much as $200 million. All four of the procurement accounts were considered and the candidates include ships, torpedoes, missiles, and sensor systems. When the final candidates have been selected, I will provide you the list of programs.

COST ESTIMATING

Senator Stevens: In your prepared statement, you mention that we can expedite the transition from development to production by four means, one being improving Navy cost estimating capabilities. How does the Navy intend to go about rectifying the problem? Can you cite specific examples where Navy cost estimating capabilities have been grossly inaccurate? What has been the effect on the Navy's management of these programs?

Mr. Cann: The Navy has been improving its methodology for cost estimating, but cost estimating still depends on the experience of the personnel who make the estimates. The Naval Material Command has a Cost Analysis Division which provides a focus for cost estimation. On major system's milestone review, an independent cost analysis is conducted by the Systems Analysis Division in the Chief of Naval Operations, and these results are compared and assesed against those of the program manager. Since the acquisition and procurement plan/strategy can significantly impact the cost estimates and program costs, the Naval Material Command has directed that concepts such as the following be studied and implemented as appropriate: (1) utilize pre-planned program improvement, (2) improve quantity and quality of business managers in the Navy, (3) develop means to reduce turbulence in program funding, (4) increase emphasis of technical evaluation and past contractor performance in source selection, (5) develop a process to include program uncertainties risk assessment in the budget process, and (6) tailor the contract's work statements to the contractor's capability. There are also three actions being taken to provide better cost estimating capability in the Navy system commands: (1) cost analysis staff increase (NAVAIR cost group was expanded from 35 to 55), (2) restructure cost analyst discipline from an accounting emphasis to a balance of accounting and engineering, and (3) improving the ADP hardware and software used by the cost analyst.

The most recent example where Navy cost estimating has been inaccurate is LAMPS III. The reasons for cost growth are very complicated, and you have been briefed in detail on this issue. Navy cost estimates contributed to 33% of the error for the program. The F/A-18 program costs were underestimated primarily in three areas: (1) inflation, (2) man-hours required by Northrop, and (3) vendor costs after the options expired. Most other Navy programs have suffered from poor cost estimates caused by low indices for inflation and by a higher rate of inflation in defense industries than in other areas of the economy.

The impact on the management of these programs from inaccurate cost estimates is as follows: (1) R&D cost growths have been significant but technical and program actions do not have impact on procurement, (2) procurement cost growths have reduced the number of units procured in a given year since the budget process defines the required dollars at least a year in advance. The reduction in number of units require the buy to stretch out which further exposes the program to cost growth from inflation, inefficient production lines, etc. The Navy management has been aggressively reacting to these cost issues by increasing the level of management focus (COMNAVAIR is directly and personually involved in LAMPS III and F/A-18), requiring detailed cost and technical reviews, and by increasing the quality and quantity of the staffs for these programs.

Fleet AAW/ASW

Senator Stevens: Give the subcommittee a general overview of prospective U.S. Fleet air defense and fleet ASW problems in 1985-1995 time period. How does this Navy R&D budget attempt to address them? What is our most serious deficiency in fleet air defense? In fleet ASW?

Mr. Cann: The major AAW problem has been the emergence of Soviet land-based naval aviation in conjunction with continuing and impressive improvements in Soviet anti-ship missile (ASM) capability. Soviet bombers, such as the BACKFIRE, are now able to stand off at long ranges from our naval task groups [deleted]. [Deleted].

Efforts to defeat the threat have concentrated on improvements in weapons and surveillance/fire control. With the development and deployment of the AEGIS system and its projected upgrades, the Navy is partially overcoming the limitations imposed by slow reaction time and lack of ECM resistance. However, more needs to be done. [Deleted]. Programmed block changes to the Standard Missile will help as will planned improvements in our point and terminal defense systems. We are continuing to look at SAM and airborne weapons for countering the BACKFIRE at long range, especially prior to ASM launch. For example, our air-to-air ASW capability will be significantly enhanced by the introduction of the AIM-54C missile.

Another major problem facing the Navy in AAW is command and control. One program we are working on in this area is Battle Group AAW Coordination. The products of this development will give the force commander enhanced command and control of surface and air AAW assets and allow us to make maximum effective use of capabilities of the AEGIS system.

The major ASW problem has been continuing improvement in Soviet submarines. The Soviet ALFA submarine has exhibited [deleted], The major effort by the U.S. to counter these capabilities involves improvements in weapons. The MK-46 Mod 5 (NEARTIP) torpedo is now in production and gives us an interim capability. The ADCAP program is designed to make significant improvements to the MK-48 torpedo in the near term. The Advanced Lightweight Torpedo and the Submarine ASW Standoff Weapon are two programs designed to give us a future capability to increase weapon range, delivery speed and lethality.

There is, and has been, a continuing effort at improvements to U.S. acoustic detection systems. Towed array systems are entering fleet service that give greatly increased passive detection capability. Localization systems and weapon delivery systems [deleted] are under development. Continuing improvements are underway in acoustic classification and localization [deleted]. Programs such as the Rapid Localization (RAPLOC) and LAMPS MK-III will help in the near term.

Non-Acoustic ASW

Senator Stevens: What is the role of Non-Acoustic anti-submarine warfare in current ASW plans?

Mr. Cann: The Navy uses acoustic technology as the primary method of surveillance, detection, tracking and localization of submarines. Non-Acoustic ASW systems play a supporting role. Two passive Non-Acoustic ASW (NAASW) systems are currently in use by the fleet: Magnetic Anomaly Detection (MAD) used by aircraft and the AN/BSQ-3A system used by submarines. [Deleted]. Conventional radar and ESM systems are also used to detect surfaced and semi-surfaced submarines. These systems have potentially significant range capability, however detection depends on target cooperation.

ASW

Senator Stevens: How significant a role will it play in U.S. ASW planning over the next 10-15 years?

Mr. Cann: Development of new Non-Acoustic ASW (NAASW) and active acoustic systems as a complement to passive acoustics could play a more prominent role in ASW planning [deleted] real significance and utility of NAASW systems has yet to be determined. Efforts are ongoing to provide a potential [deleted] improvement in Magnetic Anomaly Detection (MAD) capability over the current sensors. [Deleted].

F/A-18

Senator Stevens: Does the Department of the Navy and NAVAIR feel that they can accomplish all of the necessary flight tests and modifications to the F/A-18 with the current level of funding during FY 1982?

Mr. Cann: The President's FY-82 budget, submitted in January 1981, included $151.4M in FY-82 for continued F/A-18 development. The F/A-18 budget is developed on an expenditure basis rather than a termination liability basis and, therefore, contains no contingency reserve. The FY-82 budget estimate was developed prior to the impacts of the weight reduction and roll rate modification programs as well as the impact of the loss of aircraft TF-2 and F-12 being fully defined. Based on the latest estimates, there is a funding shortfall in both FY-81 and FY-82. The proposed FY-81 supplemental includes $42.0M for the F/A-18, and the FY-82 budget amendment includes an additional $24.0M for continued development. Current information indicates the proposed FY-81 supplemental of $42.0M is adequate to continue the development program to mid-September 1981, when an additional $10.0M will be required to fund the remainder of the fiscal year. The FY-82 budget amendment of $24.0M is deficient by $51.5M, which cannot be absorbed within the F/A-18 program. Without additional funding, a significant portion of the remaining development program would have to be deferred to FY-83, with corresponding potential cost increases in production and retrofit.

Senator Stevens: If not, does this mean that the Administration may come back to Congress with an FY 1982 Supplemental for F/A-18 R&D funding?

Mr. Cann: An alternative to the deferral of remaining developmental efforts to FY-83 as mentioned in the previous answer is additional FY-82 funding of $51.5M, either during the current Congressional review or next year through a FY-82 Supplemental.

DDGX

Senator Stevens: The Reagan FY 82 budget amendment restores $121.0 million in funding for the DDGX destroyer. Discuss how the DDGX fits into overall Navy surface warfare planning for the late 1980's and early 1990's. What would be the impact of failure to develop the DDGX on Navy surface ship force levels during the 1983-1995 time period?

Mr Cann: The DDGX is in the Navy ship building plan. As you know we envision a minimum force level requirement of 15 Battle Groups, 100 modern SSN's, amphibious lift for the assault echelon of 1.5 MAF and the requisite auxiliary shipping and strategic sea lift to support that force and the RDF. Within that force the DDGX will serve as a surface combatant in a role analogous to that of today's DDG's of the DDG 2 of and 37 class. It is imperative that preparations for the lead ship, currrently programmed for FY 85, be pursued successfully. By the early 1990's 50 current CG/DDG ships reach end of service life and will be retired. These are the general purpose surface combatant forces needed to carry out the surface Navy combat missions, in the Carrier Battle group, Surface Action Group, Amphibious Group and the Underway Replenishment Group for logistic support of the other combat missions. These missions, in the 15 carrier Navy require in excess of 130 Battle Group capable surface combatants of which more than 60 are DDGX's. The Navy is determined to float a ship capable of performing the wartime tasks for which it was intended. Without ships, in addition to the cruisers we are building to meet the fleet needs both in capability and in the numbers necessary for the 1990's, the overall missions of the Navy are jeopardized.

LIGHT CARRIERS

Senator Stevens: Much interest has been expressed in the possibility of augmenting U. S. battle group forces with light, V/STOL capable carriers.

a. Please elaborate on current U. S. design planning for CVX class carriers and the prospective role they would play in U. S. naval strategy in the future.

b. Is this Administration serious about pursuing CVX in the Navy R&D budget?

c. At what point would the Navy Department consider the option of actually developing these carriers?

Mr. Cann: As you are aware, we are vigorously pursuing a goal of fifteen deployable large-deck carriers. We see the utility of a number of smaller carriers as a highly desirable augment to the large carriers in battle groups, or as independent forces in peacetime or contingency operations. V/STOL research is ongoing in conjunction with valuable experience at sea being gained with the AV-8A. AV-8A Harrier aircraft are flying from LHAs and research is taking place in regard to ski-jump launching. Funding has been requested in our '82 and '83 programs to continue the ski-jump program as well as development of improved catapults, arresting gear and elevators. Considering the status of V/STOL aircraft and the limitation of current aircraft flying from smaller carriers, we are not ready at this time to commit large sums of R&D dollars required for CVX until we have solved current ongoing high priority requirements. The CVX could be a very real possibility for the future and will continue to be considered as our technology develops and allows a cost effective, highly combat capable smaller carrier to be added to our fleet.

ELF

Senator Stevens: The Secretary of Defense is to provide the President with a final recommendation on the ELF (Extremely Low Frequency) strategic communications project in mid-August so that a report on the future of the ELF project can be submitted to Congress by September 1. The funding level for ELF will remain at $34.8 million, and will be restricted to the ongoing effort at Clam Lake, Wisconsin.

What assurances can you give the subcommittee that this Administration is committed to a continuation of the ELF project?

Mr. Cann: The President has stated that he is not inclined to terminate the ELF program without compelling evidence to do so. There is currently an OSD Strategic Connectivity Study being conducted which will be submitted to the President by the fall. We will keep the committee advised concerning the status of this study.

Senator Stevens: Can you provide for the subcommittee an up-to-date estimate of life-cycle ELF R&D and procurement costs?

Mr. Cann: The estimated costs through fiscal year 1987 for development and operation of the ELF program are $85.1 million. The estimated annual cost for operation thereafter is $6.5 million in fiscal year 1987 dollars. These funding levels assume that only the Wisconsin facility would be completed.

LAMPS MK III

Senator Stevens: Can you discuss the reasons for these major cost increases in the LAMPS MK III program?

Mr. Cann: Before I discuss the reasons for the cost increases, I would like to say that in RDT&E, the entire LAMPS MK III program has remained very close to predicted costs over the last three years since entering Full Scale Development in February 1978. LAMPS MK III RDT&E costs were estimated to be 579.4 million in FY 1976 dollars. Actual costs were $600.8 million in FY 1976 dollars, an increase of only 3% over three years, or about one percent a year. Likewise, LAMPS has been one of the Navy's most successful research and development efforts. The program is technically sound, has experienced no program disruption, and has adhered rigidly to a schedule established in early 1978.

In the procurement and support areas, the largest contributors to the cost growth in order of magnitude are:

1. Contractor Cost Increases. These costs reflect a combination of manufacturing problems and unique Seahawk tooling requirements as well as actual experience in the market place influenced by business base, materials availability, labor costs, and, of course, the effect of inflation on their overall operation.
2. Unanticipated Inflation. Cost increases in this area are due to differences in the OMB inflation rates used in the December 1979 SAR and the December 1980 SAR.
3. Navy Cost Estimating Errors. These errors were induced by: (a) Use of overly optimistic learning curves for manufacturing predictions; (b) use of parametric cost-estimating vice actual cost data; (c) underestimating the complexity of systems integration; and (d) understaffing and lack of multidisciplined skills in Navy's cost estimating facility.
4. Program Changes. Cost increases in this area resulted from: (a) Increasing IBM's role as systems prime contractor; (b) changes in shipboard installation schedules; (c) introducing system changes resulting from experience gained in Full Scale Engineering Development; and (d) DoD management decisions driven by quantity and schedule changes in the Army's Blackhawk program.

Senator Stevens: What cost reduction/containment efforts are now underway to control future cost growth in the LAMPS MK III system?

Mr. Cann: Cost increases reported in the December 1980 SAR in the production and support appropriations expressed in FY 1976 base year dollars are, (1) APN $413.4 million, (2) OPN $55.3 million, and (3) O&M,N $25.2 million. As a result of the above cost increases, the Under Secretary of the Navy established a team to review the LAMPS MK III program. The findings of this team identified some potential cost risks in the engines, airframe, avionics, and ship electronics areas of the system. The team also identified some potential cost reduction/avoidance items, such as reduction of tooling requirements on the engines, reduction of engineering manhours on the airframe, and descoping of production system integration and test plans.

We are confident now that we know how much the program will cost. Enough money has been programmed in FY 1982 to buy the first production lot of aircraft, given that current economic projections hold true. We hope to avoid recurrence of unanticipated cost increases by virtue of the experience gained in assessing the current situation, strengthening internal cost estimating capability, and taking advantage of actual cost data from the Blackhawk program. We have identified problem areas and understand much better what this level of technology aircraft costs. We now know what the requirements are, and our major contractors have taken management and supervisory initiatives to correct problems that have stemmed from too rapid an expansion in a complex and intensified manufacturing operation.

Senator Stevens: How significant a factor is the increase in the cost of critical materials (i.e., titanium) to the cost growth problems in the LAMPS MK III system?

Mr. Cann: Considering the lead times required to execute the program, increased cost of critical materials such as titanium, cobalt, nickel, and gold used in the manufacture of engine, airframe, and avionic components accounted for 5 to 10% of the total program cost increase. Engine manufacture creates the highest demand for these materials, however, airframe manufacture is a heavy user of titanium forgings and avionic equipment manufacture requires high use of precious metals.

MK-92

Senator Stevens: How extensive a redesign of the MK-92 Fire Control transmitter is being contemplated?

Mr. Cann: The new coherent receiver transmitter will virtually be a 100 percent redesign. The current Traveling Wave Tube in the transmitter, the Backward Wave Oscillator in the receiver and various other components will be wholly replaced.

Senator Stevens: Is this redesign based upon an increase in the level of the threat or upon system performance deficiencies that have been experienced during the test stage?

Mr. Cann: The redesign is based on a combination of an increasing level of threat and known deficiencies in the present system. With the new coherent transmitter we will replace the Backward Wave Oscillator with a Crystal Control Synthesizer, improve fault isolation, and replace the present Traveling Wave Tubes (TWT) with a new redundant TWT which improves performance and eliminates the need for using hazardous SF-6 gas in the waveguide. These changes will allow us to increase the detection and track range for the CAS and STIR by 50 percent, significantly improve system performance in electronic countermeasures and clutter, as well as reduce system reaction time.

Advanced Lightweight Torpedo

Senator Stevens: The Advanced Lightweight Torpedo (ALWT) program has been restructured to incorporate a single contractor (Honeywell).

Can you discuss the reasons for the termination of a two contractor advanced development competition for the ALWT?

Why was McDonnell-Douglas considered to be too high a risk?

Have the cost estimation problems associated with the development of the ALWT now come under control?

Discuss the significance of ALWT's directed energy, shaped charge warhead on U.S. torpedo acquisition range capabilities. How does the United Kingdom's Sting Ray Lightweight Torpedo compare as a possible alternative to ALWT?

Mr. Cann: Based on McDonnell-Douglas design efforts and component test results, the Navy evaluated the overall concept as having higher technical risk, without a commensurate higher payoff, relative to the Honeywell concept. The Honeywell concept is based on more mature technology originally developed by the Navy during the three year Technology Assessment Phase preceeding the prototype contract awards. Greater Navy laboratory capacity to participate in solving technical problems as they occur. Also, it became evident that competition would not necessarily result in a better torpedo and the cost-schedule risk was increasing. The program was restructured based on the lowest risk, highest payoff approach.

Specific risks associated with the McDonnell-Douglas design include:

a. [Deleted]. Serious technical shortfalls would have gone unresolved until very late in the development phase.

b. [Deleted].

c. The torpedo as projected for the fleet was "tail heavy," thus leading to the potential for future compromises for a number of important launching platforms.

In summary, even if the McDonnell-Douglas team resolved existing technical problems, the end product would still be a torpedo with overall higher risk but with no greater performance, cost or schedule payoff. Since the original industry and Government cost estimates were low, the cost growth for continuing the competition would be quite high and significant schedule delays would have resulted. By choosing the lower risk design and increasing Navy participation from laboratory personnel who originated and successfully demonstrated the propulsion, warhead, and terminal homing concepts, current cost estimates reflect full utilization of all knowledgeable Navy and industry (Honeywell/Garrett team) people in the planning and execution of the program.

The estimates to completion are accurate, to the extent that outside influences such as differences in planned and actual inflation and new developments in threat submarines, can be predicted. Current Navy funding requirements reflect a focused and disciplined program which employs substantially improved cost and technical control measures.

[Deleted].

[Deleted]. In torpedo terminology, acquisition range designates the distance at which the acoustic system detects targets. This detection occurs during the search phase, and usually significantly before terminal homing. Regarding Sting Ray, the Navy considered Sting Ray very carefully before commencing advanced development of ALWT. [Deleted].

HARM

Senator Stevens: There has been $24 million R&D funding increase in both the FY 1981 supplemental and FY 1982 budget amendment for the High-Speed Anti-Radiation Missile (HARM AGM-88A).

What percentage of this increase is primarily restoration of funds deleted from Carter Administration budget reductions and what percentage can be attributed to underestimated labor and engineering costs?

Mr. Cann: The R&D funding increases sought in the FY-81 Supplement and the FY-82 Amendment represent a 24% cost growth. The Carter Administration FY-82 procurement deletion (and later restoration) had no effect on the R&D activity. About 40% of the cost growth can be attributed to underestimated labor and engineering costs. The remaining 60% is due to externally controlled factors such as increased overhead rates, DAR guidance which permits a larger fee, and inflation.

Senator Stevens: Have the HARM missile test results been sufficiently adequate to justify these funding increases?

Mr. Cann: Yes. Development test results were presented at a DNSARC IIB and to OSD in November 1980. Direction was received to proceed with the R&D-funded program for 45 missiles for NTE and IOT&E; and to proceed with plans to commence the initial production program of 80 missiles. Success of testing to date has been favorable for continuation of the program despite the funding increases.

Senator Stevens: How has the HARM "cost plus" contract helped reduce overall R&D and procurement costs for the missile system?

Mr. Cann: Cost plus contracts were employed for the development efforts because that contract type is most appropriate to the risk environment of a development program. For the initial production effort in FY-81, a cost-plus-incentive-fee contract with a cap was structured to allow the contractor the more liberal expenditure reimbursement provisions of a cost-type contract while, through the affect of a cost cap, provide the government the protection against uncontrolled cost growth. In each case, cost-control was incentivized. The cost cap on the initial production contract makes it the equivalent of a fixed-price type contract limiting costs while requiring performance. However, in the R&D efforts, unforeseen cost growth exceeded the cost goals despite incentive provisions.

ASW STANDOFF WEAPON

Senator Stevens: The FY 1982 budget amendment nearly doubles funding for the Submarine ASW Standoff Weapon (from $25.5 million to $50.5 million). Discuss what this additional funding will accomplish in terms of meeting original IOC schedules, replacing SUBROC and meeting the Soviet threat of the late 1980's and early 1990's.

Mr. Cann: The Navy has not requested $25 million more than the original amount programed for the ASW Standoff Weapon. When Congress approved the FY 1981 budget, the Five Year Defense Plan called for $50 million in FY 1982, just as it had the previous year when this program was started. In the FY 1982 (Carter) budget submission, however, this amount was reduced to $25 million because of an overall shortage of Navy RDT&E resources in that year. The amended (Reagan) budget submission restored the full program funding (to the FY 1980 and FY 1981 FYDP levels). Thus, the $50.1 million requested for the ASW Standoff Weapon program in FY 1982 does not represent an increased requirement in the program, but rather re-establishment of the original funding requirement.

The initial operational capability date, as supported by the full FY 1982 budget of $50.1 million and a sole-source Demonstration and Validation phase, [deleted].

[Deleted], This shortfall would be aggravated by any delay in the initial operating capability date of the ASW Standoff Weapon. Restoration of FY 1982 funding as described is necessary to avoid this delay.

Medium Depth Mine

Senator Stevens: One of the most neglected areas of naval warfare has been that of mine warfare. How will the development of the Continental Shelf mine ($27.3 million in FY 1982) fit into overall U.S. mine warfare planning in the late 1980's?

Mr. Cann: The Medium Depth mine, which was for a short time called the Continental Shelf mine, is planned for funding at $15.0 million in FY 1982 vice the $27.3 million previously indicated. It will fill the gap between the shallow water QUICKSTRIKE mine family, which is effective against surface targets in water depths [deleted], and the CAPTOR ASW mine, which can be moored in water depths [deleted].

The Medium Depth Mine will be a moored mine with a mobile warhead that will be effective against both surface and submarine targets and will be moored in water depths [deleted]. It will be capable of delivery [deleted].

Submarine Advanced Combat System

Senator Stevens: Describe the significance of the SUBACS (Submarine Advanced Combat System) program to future Navy combat control capabilities, especially for SSN-688 Class submarines.

Mr. Cann: The SUBACS program is of critical significance for SSN 688 Class submarines.

The Navy has recently deferred the introduction of a follow-on class attack submarine in favor of continued improvements to the SSN 688 Class. This means the 688 Class will be the mainstay of our submarine force for the next thirty to forty years. It will not only have to provide direct support to carrier battle groups, the mission for which it was initially designed, but it will have to support general anti-submarine, anti-surface, surveillance, and strike warfare missions as well.

This will require a combat system which is designed from the outset to present integrated data from all subsystems to the submarine commanding officer in a format he can assimilate rapidly for tactical decision making. The system must also be built with the growth capacity to handle the expanding mission in the face of an improving threat.

Our current combat systems can be expanded to cover near-term requirements, but they are operating close to the limits of their computers now, and they are not efficient in terms of size and ownership costs because they were designed in the 60's, using technology that is obsolescent by today's standards.

After careful examination of the alternatives, the Navy has elected to develop the next generation combat system using a design approach which considers the total system requirements and includes adequate growth margin from the beginning.

This is the essence of the SUBACS program. Today's technology enables us to accomplish this objective, including the addition of a surveillance capability, within the limited volume of the SSN-688 Class hull. The technology embodied in current combat systems will not support the simultaneous incorporation of all long-term improvements in the 688 Class submarine.

The SUBACS program is therefore essential to the continued improvement of the SSN-688 Class combat control capability.

RDSS

Senator Stevens: The Reagan FY 1982 defense budget amendment added $11.0 million for research and development on a Rapidly Deployable Surveillance System (RDSS). How important would RDSS be to U.S. underwater surveillance capabilities in the late 1980's?

Mr. Cann: The addition of RDSS in the late 1980's to the Undersea Surveillance System (SOSUS and SURTASS) will provide a unique and much needed capability to this important ASW effort. RDSS will provide a system that is flexible to the needs of the operational users so that surveillance can be provided where and when needed. [Deleted]. RDSS will provide a long life, moored capability with excellent detection capabilities [deleted].

Senator Stevens: What additional wartime surveillance capabilities would a semi-permanent, sonobuoy surveillance system have which SOSUS and SURTASS do not have?

Mr. Cann: RDSS, since it can be rapidly deployed, will place a system in the field as soon as the need arises. RDSS will become a quickly available asset [deleted]. RDSS systems provide the ASW commander the flexibility needed to ensure continuous surveillance in the event of war.

Shipbuilding Design Funds

Senator Stevens: The FY 1982 Navy R&D budget amendment adds $41.0 million (for a total of $90.6 million) for design funds to support future shipbuilding programs. Can the Reagan administration's shipbuilding program be implemented without these additional design funds, or could reductions be made without jeopardizing the program?

Mr. Cann: The Reagan administration's shipbuilding program can not be implemented without the additional $41.0 million of design funds. The shipbuilding design funds are used to accomplish the Contact Design Phase of the Navy's Shipbuilding Program. The output of the Contract Design Phase is an engineering data package consisting of contract drawings, contract guidance drawings and ship specifications. The Contract Design Phase is normally preceded by the Feasibility and Preliminary Design Phases. The ship specifications describe the general design requirements and the essential features, functions and arrangement of the ship. Together with the contract drawings and contract guidance drawings, they define the ship as to dimensions, structure, arrangements, performance, power, machinery, weaponry, etc. The Contract Design Phase is a prerequisite to the development of the working drawings from which a ship is constructed. In order to award a contract for ship construction, full funding of the design process is mandatory.

TAOC-85

Senator Stevens: Can the Navy assure the subcommittee that there will not be similar cost growth problems in the TAOC-85 program in the future.

General MOORE: The subcommittee can be assured to a high level of confidence that future cost growths will not perturb the program in the manner that occurred during FY81. The FY82 amendment anticipates some cost growth due to normal market instability and a reasonable inflation rate. The Five Year Defense Plan for FY82 through 86 is structured so as to sufficiently fund this program through the R&D cycle.

Senator Stevens: How will additional funding for TAOC-85 help solve the cost growth and schedule slip problems?

General Moore: Additional funding will underwrite the identified cost growth and prevent further costly schedule slippage. It will assure that the forty-one month schedule is retained and motivate the contractor to be efficient in his performance. If the present contract is adequately funded in a timely manner, the contractor assumes all cost/liability beyond the 82.0M ceiling.

MIFASS

Senator STEVENS: Cost growth has also been experienced in the Marine Fire and Air Support System (MIFASS). What percentage of the $8.2 million cost growth for MIFASS in FY82 budget amendment is attributable to inflation? to design changes?

General MOORE: Approximately 12% or about one million dollars is attributable to a higher real life inflation rate upon the MIFASS Engineering Development Model contract than was originally projected in 1979. The remaining cost growth is a direct result of the implementation of approved JINTACCS digital message standards into the design. Additionally, improvements to the interface design specifications, resulting from experience gained during development of MIFASS and other evolving complex systems that MIFASS must interoperate with i.e., Position Location Reporting System (PLRS), Digital Communication Terminal (DCT) have resulted in unanticipated cost growths. The estimated cost breakdown per system interface is as follows:

- Interface Working/Groups Support	$ .2M
- Inflation	$1.0M

- PLRS Interface	$1.0M	
- DCT Hardware and Software	$1.5M	
- JINTACCS Msg Std	$2.0M	($5M total cost FY81, 82)
- Implementation of Forward Error Correction and Time Disbursed Coding on Digital Comm Links	$2.5M	
TOTAL	$8.2M	

Note: Congressional action deferred $920,000 of RDT&E funds in FY81, which resulted in a reduction of $920,000 in the MIFASS funding profile.

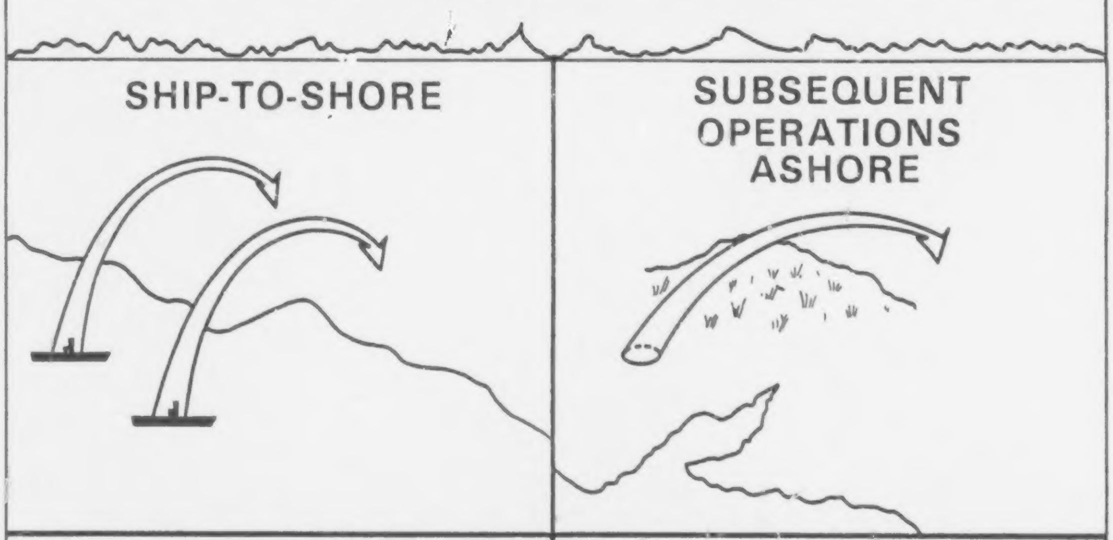
HXM

Senator STEVENS: Please discuss U.S. Marine Corps helicopter deficiencies as projected during the late 1980's and the importance of the HXM program to the Corps in overcoming these projected deficiencies.

General MOORE: The Marine Corps assault mission is performed by the CH-46E and CH-53A/D aircraft which were procured between 1962 and 1969 with the most recent aircraft delivered in 1971. These veteran aircraft are deficient in (1) inventory assets; (2) meeting the present and future threat; and (3) cost of ownership resulting from the vintage technology and aging material condition. The most critical deficiency is the inventory shortfall. The objective of the HXM program is to replace both the CH-46 and the CH-53A/D with a single common solution.

The constrained vertical lift objective of the Marine Corps is to support two of the four Marine Amphibious Forces (MAF) by simultaneously lifting the assault elements of one MAF from ship-to-shore (STS) while lifting the assault elements of a second MAF engaged in subsequent operations ashore (SOA) (See chart one). The enclosed graphic (chart two) pictures the present and future capability to perform these dual lift objectives with aircraft with the performance capability of the CH-46 and CH-53A/D. The upward trend in the 1980-83 time period represent diverted aircraft from other missions such as Navy Vertical Replenishment and Search and Rescue, not new procurement. These aircraft are replaced inpart by return to active service of some 47 stored desert aircraft. Even with these additional aircraft, the constrained lift objective will not be met. After 83 the situation worsens with aircraft attrition until block retirements occur in 1995. Mission risk begins to occur in 1983 and grows progressively worse until the early 1990's when the single STS mission will not be possible. The only solution to arrest this problem is aircraft procurement. The HXM must enter procurement by the early 1990's at the latest and completely replace the present inventory by 1996.

AMPHIBIOUS ASSAULT REQUIREMENTS


SHIP-TO-SHORE
SUBSEQUENT OPERATIONS ASHORE

MAF ASSAULT ELEMENTS 5400 TROOPS + 350 TONS	MAF ASSAULT ELEMENTS 2600 TROOPS + 150 TONS

CHART ONE

MARINE MEDIUM HELICOPTER FORCE DEFICIENCIES

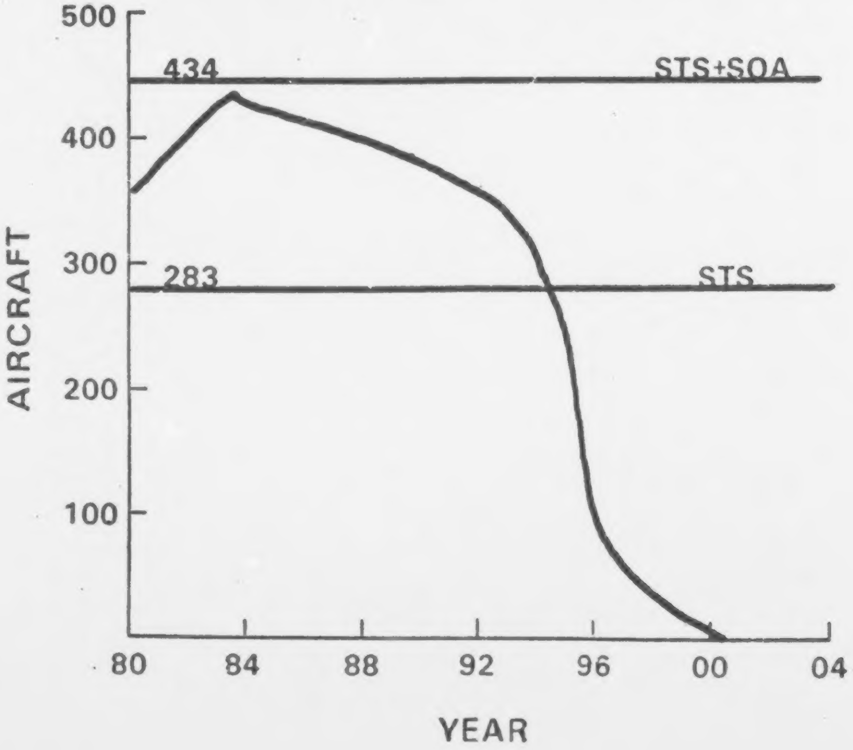


CHART TWO

HXM

Senator STEVENS: Discuss the trade-offs between an off-the-shelf solution to the helicopter deficiency problem and a state-of-the-art solution. Which solution would be most cost-effective?

General MOORE: Popular off-the-shelf solutions from domestic sources include variants of the Sikorsky H-60, the Boeing-Vertol CH-46 or CH-47 as well as the Bell 214ST. Another option is the Super Puma made by Aerospatiale of France. The U.S. Coast Guard has recently selected an Aerospatiale HH-65 for the Search and Rescue mission. All of these options would require varying degrees of modification for adoption to the HXM mission. Off-the-shelf options would require the least R&D costs in the early years and would provide the earlier (about two years) IOC. Because of designs and levels of technology, there would be additional costs in fuel, manpower and in some cases additional ships for an equal force capability. The state-of-the-art development we refer to is described as a new development of a conventional rotorcraft using proven low risk technology but optimized to the unique Marine Corps mission. This option would meet the requirement and fit within the present shipping because it would be designed to do precisely that. The R&D costs for a development option would be greater than off-the-shelf, it would take approximately two years longer and there would be less procurement costs because fewer aircraft would be required. The significant savings would be in operational and support costs because a modern aircraft would use less fuel, require less manpower support and no extra ships. In summary, off-the-shelf options require less front end funding but cost more overall and will be short of the requirement with no new capability such as self-deployability or enhanced cold weather operations available in a new development. The overall estimate is that off-the-shelf means the highest life cycle cost and the least capability. However, the present acquisition strategy is to solicit from industry proposals in both categories and reserve judgments until all alternatives have been objectively evaluated and the trade-offs considered and then to make an informed decision.

LCAC

Senator Stevens: General Moore, in your prepared statement you mention two positive attributes of the LCAC (Landing Craft Air Cushion) program -- its projected ability to significantly increase the number of beaches worldwide where amphibious assault forces could be landed; and its ability to move across the beach rapidly to eliminate congestion at the water's edge.

a. Can you expand on these comments, particularly on the number of additional beachheads where amphibious assaults coud be landed with the LCAC?

b. Where would we be able to land with the LCAC where we can't land now?

General Moore: A number of physical factors go into determining the assaultability of beaches. With conventional landing craft, beach gradient is a key limiting factor. Today's landing craft ground out with a gradient that is less than one-to-fifty. At this point Marines would have to wade ashore with their combat equipment and supplies. In the Persian Gulf this could be a considerable distance, which would even be lengthened under low tide conditions. Other limiting factors could include: offshore reefs, sand bars, mudflats, paddies, marshland and sand dunes. Any of these factors would hinder or prevent landing with conventional craft. Conversely, with the air cushion technology represented by the LCAC, these limiting features could be overcome. In addition to overcoming these limitations, we place a heavy burden on the enemy defenses which must be spread more thinly in defending the additional assaultable coastline.

To answer the second part of the question: Where would we be able to land with LCAC that we can't land now? To take an example of current interest, let us look at the much-discussed Persian Gulf area. In this area virtually the entire coastline could be negotiated with air cushion landing craft. However, with conventional craft suitable beaches can be found nearly only four out of twenty-one ports or other population centers. This great disparity between the capabilities of LCAC and conventional craft shows clearly why we consider LCAC to be the greatest advance in amphibious warfare since the introduction of the helicopter.

MPWS

Senator Stevens: What design/engineering differences are most pronounced in the choice between proceeding with a hybrid vehicle or conceptual vehicle alternative for the Mobile Protected Weapons System (MPWS)?

General Moore: By going with a hybrid vehicle, the Marine Corps would trade off the early hybrid IOC against the conceptual technology which would increase the agility, hit probability, effectiveness and size of the MPWS. Specifically, a conceptual vehicle would result in a system with a more sophisticated firing system and a stabilized gun. Both of these innovations would increase the hit probability of the MPWS. A better gun system could also be employed using the high velocity gun technology currently being developed by the Armored Combat Vehicle Technology (ACVT) program. Additionally, the agility of the vehicle could be increased and the profile could be decreased by the employment of a rotary or turbine engine which would increase horsepower but decrease the size of the engine.

Senator Stevens: At this point in time can you judge which alternative would be more cost-effective?

General Moore: No, sir. It is too early to make this determination. Approximately ten hybrid and conceptual design studies contracts will be awarded during May 1981 and the results of these nine month contracts will provide much of the information which is needed to make a determination. Information from these studies and the Advanced Antiarmor Vehicle Evaluation (ARMVAL), Armored Combat Vehicle Technology (ACVT) Program, Field Analysis Concept Test (FACT) and ongoing 75/90 high pressure automatic cannon tests will provide sufficient information to make an intelligent determination at DSARC I scheduled for late FY 1982.

LAV

Senator Stevens: Discuss the significance of the LAV (Light Armored Vehicle) development to U.S. Rapid Deployment Force plans for the 1980's.

General Moore: The LAV is being procured by the Marine Corps to enhance both the firepower and mobility of our ground forces. We intend to form three battalions which will have significantly improved firepower through the variety of weapons systems which are presently planned. Additionally, the tactical mobility of these battalions will be enhanced through the organic maneuverability afforded by the LAV. The lightweight and relatively small size improves the strategic mobility of the force by allowing the LAVs to be airlifted by strategic aircraft. All of these factors afford the RDF planners with the capability of rapidly moving a self-contained and combat capable force to any place capable of landing the strategic airlift planes.

SMAW

Senator Stevens: The SMAW (Shoulder-Launched Multipurpose Assault Weapon) is now ready for full-scale engineering development. Is the Marine Corps convinced that all possible alternative launcher systems options to the SMAW/B-300 single tube, reusable system have been exhausted?

General Moore: The Marine Corps has looked at other potential alternative launcher systems and has decided that it would be in our best interest to release a Request for Proposal (RFP) to Industry requesting their proposals on merging our SMAW warhead to their fielded launchers/propulsions system. By the use of this off-the-shelf technology, the Marine Corps could make a production decision in FY83 and field the system in FY84. Thus our Marines would have their SMAW quicker and the Marine Corps will have saved development costs by using off-the-shelf equipment.

Senator Stevens: How did the single tube, disposable launcher prove itself to be superior to the two other launcher designs during the troop and engineering test phase?

General Moore: First, I must say that it was the single tube, reusable launcher which proved itself to be superior in these tests. Specifically it proved to be superior in the aspects of transportability, portability, durability and most importantly, firing accuracy. Marines who participated in these tests preferred the single tube, reusable launcher over the other designs.

SEAFIRE

Senator Stevens: Last year the Senate Armed Services Committee zeroed SEAFIRE because the Navy did not support the program in its POM '82. The Navy altered its position and fully supported SEAFIRE. I have here a copy of a letter from the Secretary of the Navy dated 4 December 1980 stating that SEAFIRE is budgeted and programmed for full-scale development. SEAFIRE was in the Carter budget for FY 82 but subsequently was deleted in the present budget. In view of the strong endorsement from the previous Secretary of the Navy, we question the vacillating on this program. This committee requests that both of you provide for the record the Navy and Marine Corps answer to the following question: What were the missions that caused the Navy and Marine Corps to pursue this program so vigorously, and how have they changed such that the system is no longer required?

General Moore: Critical to the success of an amphibious operation is adequate naval gunfire support. Currently the total number of naval guns is dwindling with no major caliber guns in the fleet to provide the required range and lethality against hard point targets. This makes a requirement for a gun and round to be extremely accurate and efficient to make up for some of this lost ground. Five-inch guided projectile (GP) with SEAFIRE, an electro-optical tracking and aiming device aboard the ship is an answer.

More specifically, the use of GP/SEAFIRE during advance force and pre-assault bombardments will be vital to the subsequent successful landing of forces. Although there are other laser systems that could be used with GP, only SEAFIRE will be constantly available as a designator for the firing ship.

The ancillary benefits of SEAFIRE also make its continued funding of utmost importance. The rapid ability of the ship equipped with the system to locate, engage and destroy the target will lessen its exposure to counter battery fires from enemy weapons systems. This ultimately will make the ship more survivable.

[Deleted].

This is particularly important to the Marine Corps faced with today's threat. The ability to determine if the enemy [deleted] in an amphibious landing area may be the difference between success and failure for the amphibious assault.

I emphasize for the record that the Marine Corps continues to offer the strongest support for the continued development and procurement of SEAFIRE. The Marine position has not changed.

SEAFIRE

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Admiral Monroe: The SEAFIRE system was being developed to provide electro-optical fire control capabilities for Navy surface ships. Although SEAFIRE would perform several functions, its primary purpose was to provide a shipboard illuminator for 5-inch guided projectiles against both surface and shore targets. Over the years SEAFIRE has progressively declined in priority, not because the missions have changed, but because new weapons development is changing the manner in which we must meet these mission requirements.

For surface warfare, the proliferation of anti-ship missiles, both on Soviet ships and on ships of other potential threat nations, has extended the range of surface actions. If our ships are to survive surface engagements, we must disable or destory enemy ships at ranges beyond the horizon, for that is where they will launch missiles at us. Our HARPOON missile, targeted by LAMPS or Over-the-Horizon-Targeting (OTH-T), gives us this capability today in excess of 50 miles. TOMAHAWK anti-ship missiles, now in development, will increase this range manyfold. SEAFIRE, which can illuminate enemy ships only within the visual horizon, is of much lower priority in the Navy allocation of R&D procurement funds.

For shore bombardment, again new technology is changing the nature of warfare, and we must adapt or become ineffective. Enemy shore-based weapons, in particular anti-ship missiles, are raising the threat levels to such a degree that we can no longer depend on operating our ships at low risk close enough to hostile coastlines to utilize SEAFIRE. To identify a shore target visually--a necessary step in SEAFIRE illumination for guided projectiles--our ships must operate at close ranges, where the leverage is with the enemy to engage us before we can target him. Even at close range, any form of terrain obstruction (hills, sand dunes, trees) will prevent use of SEAFIRE, as will adverse weather, the smoke and dust of the battlefield, etc.

For amphibious assault, the Navy is vitally concerned about providing adequate fire support for the Marines. We are working to increase our ships' standoff range from defended coastal areas, and our Navy-Marine team must rely more on other types of fire support than ships' guns. We are carrying out a wide range of R&D programs to achieve this. For example:

- The AV-8B which we are developing is the finest close air support aircraft in the world for the Marines' type of operation.
- The F/A-18, also under development, will be a superb ground-attack interdiction aircraft.
- LASER MAVERICK is being pursued at high priority, to provide a standoff close air support air-to-ground weapon for Marine aircraft.
- IIR MAVERICK is in development to provide Navy aircraft a standoff interdiction weapon.
- The HELLFIRE system is being developed to provide an improved helicopter-mounted guided weapon for fire support.
- The CH-53E is becoming operational to enable Marines to move their own unit artillery ashore faster and more effectively for fire support.
- The Marines' forthcoming Mobile Protective Weapon System (MPWS) will also improve unit firepower in amphibious assault.
- The battleship recommissioning will give 20-mile standoff ranges for 16-inch projectiles.
- The TOMAHAWK Land-Attack Missile (TLAM), fired from Vertical Launch Systems on surface ships, will be effective for use against fixed targets in the pre-assault phases. Both of these systems are being pursued aggressively.
- We are developing the air-cushion LCAC assault craft to supplement the CH-53E helo in enabling us to carry out amphibious assaults from over the horizon.

SEAFIRE is of lower priority than any of these because gunfire ships must get very close to the beach to illuminate targets, and our ability to do this is quite limited. As much as we would like to have SEAFIRE on our ships to deal with those unique situations in which it would be useful, the high price tag, and the large number of much higher priority efforts we must pursue, have caused us to terminate the program.

QUESTIONS SUBMITTED BY SENATOR HATFIELD

F/A-18

Senator Hatfield: The future of the F/A-18 fighter/attack aircraft appears to be in question because of recent cost growth and persistent technical problems. In the event of that program's being terminated or not continued into full production, what uses could be made of the F/A-18's avionics, engine, and other subsystems in other Navy/Marine Corps or USAF programs?

Mr. Cann: The F/A-18 is central to the modernization of Navy and Marine Corps tactical air forces. The Administration remains fully committed to the program and plans to continue production without interruption; accordingly, there has been no review of F/A-18 subsystems for potential use in other DOD programs. Since the original development estimate, 566 aircraft have been added to the F/A-18 program and the cost has increased by 25 billion dollars. Of this price increase 77% is due to inflation, 18% to changes in program requirements and only 5% to constant dollar cost growth. The F/A-18 is the most severely tested aircraft ever developed by the Navy. The technical problems which have been discovered have not been overwhelming, and there are no technical problems which have not had a corrective action identified. By consolidating government and contractor testing at a single site and by insisting on stringent test parameters, the Navy has ensured that problems are identified and corrected prior to delivery of the aircraft to the fleet. This testing to rigid requirements at a government site exposes problems for public comment but has proven to be cost-effective.

V/STOL AIRCRAFT DEVELOPMENT

Senator Hatfield: In the FY 1972-78 period the Navy invested some $88 million in a V/STOL aircraft development effort known as the Thrust Augmented Wing (TAW) program, involving the XFV-12A technology demonstrator. Its special feature is the expulsion of engine exhaust through the wings to achieve additional thrust by aerodynamic means. Expected in 1972 to yield a supersonic V/STOL plane that would be operational by the early 1980s, the XFV-12A TAW program has obviously failed in this objective. In late 1979, the Defense Science Board recommended termination of the TAW program in order to concentrate on fewer and more promising V/STOL program. What is the present status of the TAW program in regard to (1) its funding by Fiscal Years (FYs 72 through 81), (2) the rationale and reasons for its continuation, and (3) the future prospects of this effort? What other Navy RDT&E efforts to develop supersonic and subsonic and subsonic V/STOL aircraft are now underway?

Mr. Cann: The following summarizes the funding history of the TAW project:

TAW FUNDING SUMMARY
($'s in millions (real))

FY	72	73	74	75	76	76T	77	78
	8.0	11.3	24.3	8.6	19.0	2.56	9.9	4.3
FY	79	80	81				TOTAL	
	4.9	3.1	0.6				$96.6M	

The reasons and rationale for TAW's continuation are that this unique technology offered the potential for a supersonic vehicle using thrust enhancement by aerodynamic means thereby alleviating the requirements for inordinately large thrust-to-weight ratios and attendant high engine weight, high fuel consumption and high drag problems associated with other supersonic powered lift concepts. Further thrust augmenters have a benign exhaust footprint which is dramatically lower than competitive concepts. For the above reasons, TAW technology is very attractive for Sea-Based tactical air applications where weight, size and ship-aircraft interface are critical. Finally, the XFV-12A was the only ongoing effort by an U.S. agency or service directed toward a supersonic V/STOL vehicle. A recently completed technical review has highlighted the technical difficulties and high risk in proceeding with fabrication of a full size article. Accordingly, the Navy will not continue with a thrust augmentation vehicle in the 6.3 advanced development category, and is not providing any future funding support for it. Expiration of previously obligated TAW funds will occur in May 1981.

The thrust augmentation principle continues to hold promise for applications to future sea-based air vehicles. The Navy is currently investigating means to pursue thrust augmentation technology with the goal of resolving technical problems and acquiring sufficient data on performance and fabrication technology to make future decisions on the concept.

We are supporting tilt rotor development which would be directly applicable to a broad range of Navy and Marine Corps missions. In addition, a joint Navy-NASA-Grumman full-scale wind tunnel effort oriented toward subsonic application is nearing completion at NASA Ames test facilities. Under this effort, however, transition, and conventional wind tunnel data were obtained for a full-scale powered V/STOL model using tilt nacelle propulsion. Additional investigations are being explored in other propulsion schemes such as lift/cruise fan. These efforts will provide the technology base to develop aircraft for acquisition and initial operational capability in the 1995 to 2000 timeframe. The initial full-scale development effort resulting from this technology will concentrate on a basic design with variants which will fulfill missions of Marine Corps assault, airborne early warning, anti-submarine warfare, airborne tanker, and fleet logistics support. Also, in accordance with Congressional direction, funds appropriated for the AV-8B+ have been applied to preliminary exploration of an uprated Pegasus engine and radar integration options.

The TAW program had been the primary Navy RDT&E effort to advance development of supersonic V/STOL aircraft. In addition, the Navy and NASA have jointly sponsored limited wind tunnel testing of several promising supersonic multi-engine V/STOL configurations. A similar effort for single engine designs is about to commence. This effort is oriented to future requirements for fighter, attack and reconnaissance aircraft. Its purpose is to establish a design data base of completed wind tunnel tests and ground-based flight simulations similar to the current base which has been developed for the subsonic class of V/STOL aircraft.

ARAPAHO

Senator-Hatfield: Please discuss the current status, future plans, and funding requirement for ARAPAHO activities.

Mr. Cann: The ARAPAHO development model, now undergoing the final stages of fabrication at the Naval Aviation Engineering Center, Lakehurst, New Jersey, is 80% complete. All major contracted components have been delivered. This prototype is situated on a simulated merchant ship main deck above an unused runway surface. First helicopter landings were conducted there in October, 1980 using an 18,000 pound SH-3H helicopter. In mid-February 1981 a "form and fit" compatibility test of selected modules was successfully conducted on board a container ship in Baltimore harbor. The remainder of CY-1981 will be devoted to completing fabrication of the prototype to the optimum configuration for at-sea testing and completing the day/night shore based test flying. At-sea testing is programmed to commence in the Spring of CY-1982 to demonstrate concept feasibility. Follow-on activity will be dependent upon the results of the feasibility demonstration and funding priorities of competing programs. A draft operational test plan has been developed should the results of the feasibility demonstration justify moving into the next phase of the program. The funding requirement to carry the program through completion of the feasibility demonstration is $2M in addition to the $6.5M provided by the Congress in FY 1979.

HERITAGE FOUNDATION ANALYSIS

Senator Hatfield: The Heritage Foundation has recently prepared a useful analysis of Defense budget issues, in a report entitled Mandate for Leadership -- Policy Management in a Conservative Administration. (Material from pages 132-133 of this report is quoted below.) There are a number of issues the report raises that concern me.

For example, failure to develop technology prototypes may lead to the entry of immature technology into full-scale development, increasing the cost and time of development and producing less operationally ready equipment. "A trend away from full-scale development towards technology prototypes could result in some reduction in the total RDT&E budget," according to the study. Please comment on this idea and provide for the record some specific illustrations of technology prototype development activities currently underway.

New weapons systems are not only expensive to develop but also lead to high costs of retraining and reprovisioning before entry into operational service. The Heritage Foundation study notes that "Soviet designers must in essence 'show cause' why a component should be changed, while in the American system, engineers must 'show cause' why it shouldn't be different." This has led to many cost-increasing changes that are unrelated to final system performance and operational readiness, according to many students of U.S. weapons acquisition policy. By contrast, the Soviets have emphased an incremental and evolutionary development approach based on component improvements rather than new starts. What Navy/Marine Corps weapon systems currently in Full-Scale Development represent component improvements or follow-on developments of systems already in operational use? What systems now in Full-Scale Development represent totally new systems being developed as the first of a new product line? Please identify the most clear-cut examples of each of these two approaches to weapons system development and acquisition.

According to the Heritage Foundation study cited above, "The Military acquisition community has become accustomed to developing its own equipment for everything from transport vehicles to administrative computers. Such an approach may have been justified in earlier times when military technology was in fact far ahead of the civil sector . . . . However, the situation has now changed dramatically. In many areas, military technology is now considered behind its commercial equivalents, as the commercial sector has vastly outstripped the military sector in size and dynamism .... Moreover, since most commercial equipment exists in vastly larger quantities than its military equivalent, it works more reliably, and more people are trained in its maintenance (which must, because of commercial competition and pressures, be kept far more simple). Furthermore, if the U.S. is to develop a meaningful industrial mobilization capability, it will have to be centered about the adaptation of commercial products." How do you assess the prospects for more use of commercial products and components in Navy/Marine Corps weapon systems? What would be the implications of such commercialization of these systems in terms of costs and operational readiness?

Mr. Cann: Senator, I will answer each part of your question separately.

The statement "A trend away from full-scale development towards technology prototypes could result in some reduction in the total RDT&E budget" is partially correct. Clearly savings can be made not only in RDT&E but also in total life cycle costs if the technical feasibility of new technology concepts is demonstrated before undertaking full-scale development. The "front-end" costs of technology prototype demonstration (the 6.3A programs) are much less than those of full-scale development (6.3B) and unquestionably less than those of procurement and operations so that occasional prototype failure is not financially catastrophic. Further, competitive technology prototype efforts (that are economically feasible) can often result in the best system at lowest cost and, since technical risk is reduced, can reduce full-scale development time. On the other hand many concepts, where technology feasibility is not an issue or competitive prototyping is cost prohibitive, should go directly to full-scale development for timely evaluation of all critical support systems (especially important for complex systems), producibility, operability, and other aspects impacting the utility and affordability of new operational systems. An example of a prototype system now in full-scale development is the Vertical Launching System for surface-to-air, surface-to-surface and ASW missiles.

To answer the second part of your question, there is no question that more pre-planned product improvement (P^3I) is desirable in the U.S. system, and that the Soviets are proven practioners of the P^3I art. It must be understood, however, that the Soviets do not rely exclusively on evolutionary product improvement to upgrade their capabilities but have also institutionalized a multi-generation planning system that often encompasses revolutionary improvements in systems, especially in such high impact areas as strategic warfare. There is a need for a similar balanced approach by the U.S. In contrast to the Heritage Foundation findings, the U.S. trend of recent years indicates a turn against innovation and risk-taking in military developments at a time when we are in real danger of losing our qualitative edge to an already numerically superior enemy. P^3I procedures are appropriate in such Navy programs as the SAM Standard Missile (block improvements). There is also a need for revolutionary developments in this and other critical mission areas. Examples are the Vertical Launching System and the F/A-18 aircraft.

In answer to the final part of your question, the Department of the Navy has conducted programs with the intent of utilization of commerical equipments within the system. This is particularly done in support systems such as test sets, trainers, and handling equipment. Normally, commercial units do not meet the environmental requirements for the at-sea application of aircraft, ships, submarines, and weapons. Commerical equipments have been purchased and the functions have been tested aboard ships, submarines, or aircraft. Successful tests can result and have resulted in the function (usually electronic or computer software oriented) being accepted for military application; the equivalent hardware is then militarized to provide the environmental protection and readiness required. Some savings in R&D cost do result as the design has been developed. As militarized, the readiness of commercial design can provide the desired readiness in the operational environment. Most commercial computers and electronic systems have adequate reliability in the sterile environment of industrial/commercial application; hence, the readiness is achieved by assuring the equipment is adequately protected and fabricated for the military environment. This necessary design change for military application normally results in procurement buys which are not much lower in costs than the procurement of designed military systems. As systems continue to increase the application of electronics and computers, the utilization of commercial systems functions will continue to be adapted wherever possible.

QUESTIONS SUBMITTED BY SENATOR STENNIS

MPWS

Senator STENNIS: Tell me about the existing hybrid vehicle which the Marines are considering for possible use in the Mobile Protected Weapons Systems (MPWS) program.

General MOORE: The Marine Corps released a Request for Proposals (RFP) to Industry in September 1980 for design studies for both the hybrid and conceptual MPWS. Proposals have been evaluated and contracts will be awarded for both hybrid and conceptual designs in May 1981. Three contractors were chosen for the hybrid version and included both tracked and wheeled (6X6 and 8X8) vehicles. Potential armament on these hybrid vehicles varied from the 76mm low-pressure gun with a TOW up to the 75mm high velocity gun now under development by the Armored Combat Vehicle Program and the Marine Corps. Another key difference between the hybrid and conceptual vehicle is that none of these three hybrid vehicles would have a stabilized gun system.

Senator STENNIS: How would development costs of adapting this vehicle compare with the cost of developing a completely new system from a conceptual design?

General MOORE: Although a better cost assessment will be available in early 1982 as the result of information gained from the design studies, funding profiles have been developed to support either a hybrid or a conceptual approach. Funding for the hybrid approach will be in the vicinity of $140 million over the FY82-FY84 time frame whereas the conceptual approach would be approximately $229 million over the FY82-87 time frame. Added to either of these approaches would be the requirement for approximately $95 million for development of a high velocity gun system. At DSARC I (late FY82) the Marine Corps will determine which of these two approaches will be continued into the next development phase.

LAV

Senator STENNIS: What weight class vehicles are the Marines looking for in the Light Armored Vehicle (LAV) program?

General MOORE: Because of the helicopter lift requirement for the LAV, the Marine Corps has set a maximum weight restriction of 14.5 tons for this vehicle. This figure is based upon the lift capablity of the Marine Corps' heavy helicopter, the CH53E, and takes into consideration climatic and geographic conditions which affect almost all of our anticipated scenario locations.

Senator STENNIS: Is the Army pursuing a similar type vehicle for tactical mobility units?

General MOORE: Yes sir, the Army is pursuing a vehicle that is similar to our Light Assault variant of the LAV. The Marine Corps' Light Assault LAV requirement is for a wheeled or tracked vehicle which is designed to mount a 25mm, M242 Chain Gun in a two-man turret. The Army unpublished requirements are more restrictive and address a need for a 6X6 wheeled vehicle with a stabilized 25mm gun and a passive sighting system. The Marine Corps' Request for Proposal (RFP) to Industry on 14 April stated that these Army's requirements were desired; but that the Marine Corps would be willing to accept less so as to attain the fielding of the LAV's in 1983.

Senator STENNIS: Approximately how many candidate vehicles are available off-the-shelf that can meet the requirements for this mission?

General MOORE: We anticipate that there are about ten vehicles which will meet the requirements for the LAV. Approximately 45 contractor and subcontractor representatives attended the release of the Request for Proposals (RFP) at Quantico, Virginia on 14 April. Among the most familiar vehicles and their U.S. licensee expected to submit their proposal for the LAV are the following:

Cougar by General Motors of Canada
Hydracobra of Brazil by Bell Aerospace
Commando by Cadillac Gage
Scorpion by Alvis of England
Dragoon by Arrowpointe
AMX-10 by Giat of France

Senator Stennis: Your statement mentions the possibility of adapting the LAV weapon system to allow for a family of mission variants based on a common chassis. What type missions are we talking about?

General Moore: The Marine Corps' present plans are to purchase the following mission variants: Light Assault (25mm automatic cannon), Assault Gun (75-105mm low or high velocity gun), Anti-Tank (TOW), Mortar, Command and Control, Recovery, Logistics and Air Defense.

SEAFIRE

Senator Stennis: The Navy has not included funding in FY 1982 for SEAFIRE which is a shipboard laser illuminator. What does this do to the Marine assault capability in amphibious operations? Isn't it true that the 5-inch laser guided projectile with its ability to knock out land targets and bunkers cannot perform without the shipboard laser illuminator? What would be the Navy's other capability for fire direction control to assist amphibious operations if SEAFIRE is not available?

General Moore: In responding to your question let me begin by discussing briefly the types of laser designators currently available or under development. First there is the MULE (Modular Universal Laser Equipment). The MULE is in development and is designed to be man portable for use by Marine ground forces. Then there is the GLLD (Ground Laser Locator Designator), an Army system for ground forces similar in use to the MULE but not man portable. There are also a variety of airborne laser designators for use on aircraft. Lastly, there is the SEAFIRE system. SEAFIRE is the only shipboard laser designator under development.

Now to address the specifics of the question. Critical to the success of an amphibious operation is adequate Naval gunfire support (NGFS). Currently there are no major caliber guns that provide for sufficient range and sufficient lethality against hard point targets. It is hoped that the extreme accuracy and first round hit capability of the five-inch guided projectile (GP) with the SEAFIRE system can make up for some of this lost ground. To answer the first part of the question: without a SEAFIRE/GP capability, amphibious assault against a determined force may be impossible to undertake.

The second part of your question indicates that GP cannot perform without SEAFIRE. This is not totally accurate. All of the systems I mentioned, MULE, GLLD, airborne lasers and SEAFIRE, can be used to designate GP. But of these systems only SEAFIRE is always available when the gun is ready to fire. This would be most critical in amphibious operations during the pre-assault bombardment prior to the landing. During this period the ships will be most efficient relying on SEAFIRE rather than an external system. Airborne designators could be used but they won't be nearly as reliable due to the threat, weather, loitering time or higher priority targets. The MULE and GLLD will not be ashore during this early period of the operation.

To answer the last part of your question: the Navy has no other ship-based designator to do the job SEAFIRE can do. Without this particular system, we lose the gun platforms' ability to fire GP without relying on other resources.

JSSAP

Senator Stennis: I note that the Marines are paricipating with the other Services in the Joint Services Small Arms Program for improved capabilities in rifles, machineguns, and grenade launchers. When can we expect some improvements to come out of this effort?

General Moore: The Joint Services Small Arms Program (JSSAP) has evolved into an excellent forum for recognizing joint services requirements and producing weapons which can be used by many of the services. The below weapons systems of the JSSAP will commence procurement starting in FY82-83.

Weapon	Commence Procurement
M16A1 Rifle Product Improvement	FY82
SQUAD Automatic Weapon (SAW)	FY82
M-19 40mm Machine Gun	FY82
9mm Pistol	FY83

MRASM

Senator Stennis: The Navy and the Air Force were cooperating in a joint venture for a Medium Range Air-to-Surface Missile (MRASM). The Navy has pulled out of this venture and apparently now will concentrate on the HARPOON with the imaging infrared (IIR) seeker. Where do we now stand on this program for development of an air-to-surface standoff missile?

Mr. Cann: Navy requested to withdraw from the joint MRASM program for the following reasons:

1. Navy was being directed to develop two models of a land-attack-only Tactical Air Launched Cruise Missile (TALCM) based on TOMAHAWK, plus IIR HARPOON for ship attack. Sufficient funding to fully develop and procure all missiles was simply not available. Navy prioritized its requirements as IIR HARPOON first and TALCM second, because the IIR HARPOON was about half the estimated cost of TALCM and would fully meet Navy's near-term requirements for a standoff missile in the category of IIR HARPOON and TALCM.
2. Twice as many IIR HARPOONs could be carried on board aircraft carriers as could TALCMs.
3. IIR HARPOON also offers advantages in ease of shipboard handling and safer flight operations on board the CV.
4. Probably most importantly, Navy believes that IIR HARPOON can be developed and procured very nearly on time, on cost and will be a highly reliable and effective missile which will fully meet Navy's requirements. Navy does not have that same high level of confidence in TALCM's ability to meet its cost, performance, and schedule goals, because its development is not based on a proven operational weapon.

IIR HARPOON & TOMAHAWK TALCM

Senator Stennis: I understand both the Navy and the Office of the Secretary of Defense reviewed the IIR HARPOON and the TOMAHAWK air-launched cruise missile (TALCM) as to cost and mission effectiveness. What were the findings?

Mr. Cann: Both the Navy and the OSD review concluded that TALCM would be 50% to 80% more expensive than IIR HARPOON; and that while the IOCs were similar, the TALCM had greater schedule risk.

In addition, the Navy review (which addressed effectiveness as well as cost) concluded that in the ship-attack role and in the IIR mode of land attack, both missiles are comparable. TALCM, of course, has an autonomous capability to attach fixed land targets.

IIR HARPOON

Senator Stennis: I understand there is $14 million remaining for the FY 1981 appropriation which is reserved for continued work on the IIR HARPOON. Is this correct, and how will the funds be used?

Mr. Cann: True. When the Navy and OSD agreed in January 1981 to stop work on the land attack only TALCM for Navy and proceed with a Tomahaawk variant for Air Force and IIR HARPOON for Navy, the $23 million appropriated in FY 81 for these projects was divided $9M to the TOMAHAWK variant and $14 million to IIR HARPOON. The $14 million was deferred by the Navy, pending Congressional approval of this approach. When Congressional approval is received, the funds will be used for IIR HARPOON as follows:

o Guidance Set Development (Brass boards for seeker inertial navigation system, computers, etc.)	$8.5M
o Aircraft Integration	1.0M
o Government support at NWC China Lake (Modifications to aircraft and systems for captive flight tests.)	2.0M
o Data Link Development	1.5M
o Systems Engineering	1.0M

ELF

Senator Stennis: What is the status of the Extremely Low Frequency (ELF) program and how will the $34 million requested in the amended fiscal year 1982 budget be used?

Mr. Cann: On April 10, 1981 the Department of Defense announced that the Wisconsin Test Facility will be reactivated. The ELF program will be restricted to the ongoing effort at Clam Lake. Any decision to expand ELF further will be made after a careful evaluation of the Defense Department's overall strategic command and control systems. Efforts have begun to reactivate the Wisconsin Test Facility, identify the first three submarines to be equipped with existing Research and Development receivers and antennas, inspect interference mitigation devices installed at local telephone and utility companies, and hire a Managing Engineer for the test facility.

The $34.9 million requested in the amended fiscal year 1982 budget will be used to operate the Wisconsin Test Facility, refurbish and install existing receivers, develop and install antenna and ground fault detection devices, establish an environmental monitoring program, develop an improved antenna ground, develop operational receivers and high-speed receiving antennas, upgrade the shore transmitter, and develop transportable components and transmitting antenna system.

NOSS

Senator Stennis: The Navy was to participate in a joint program with NASA and the National Oceanic and Atmospheric Administration (NOAA) called National Ocean Satellite System (NOSS). Navy applications were to include anti-submarine warfare, navigation and targeting accuracy for ballistic missile submarines and ship routing. What is the status of this program?

Mr. Cann: The Navy terminated its participation in the NOSS program in February 1981. The reason was affordability. Although the need exists for some of the NOSS-type oceanographic data, the cost far exceeded the benefits that would have been realized. The Navy was unable to support the program due to other more urgent service requirements. We are currently examining less costly approaches to satisfy this data requirement.

ASW Standoff Weapon

Senator Stennis: Tell me about the ASW Standoff Weapon. The FY 1982 budget amendment includes $25 million "to support increased levels of contractor activity and competition during the Demonstration and Validation phase." I now understand that a single contractor has been selected on a sole-source basis to continue sustaining engineering. Does this mean that the $25 million will no longer be required?

Mr. Cann: The Navy has not requested $25 million more than the original amount programmed for the ASW Standoff Weapon. When Congress approved the FY 1981 budget, the Five Year Defense Plan called for $50 million in FY 1982, just as it had the previous year when this program was started. In the FY 1982 (Carter) budget submission, however, this amount was reduced to $25 million because of an overall shortage of Navy RDT&E resources in that year. The amended (Reagan) budget submission restored the full program funding (to the FY 1980 and FY 1981 FYDP levels). Thus, the $50.1 million requested for the ASW Standoff Weapon program in FY 1982 does not represent an increased requirement in the program, but rather re-establishment of the original funding requirement. This requirement exists regardless of whether the Demonstration and Validation phase is competitive.

Senator Stennis: What advantages accrue to the Navy by going sole-source on this contract rather than continue the competition as planned?

Mr. Cann: With a single contractor, it is possible to revise the schedule and funding profile for ASW Standoff Weapon RDT&E. The revised schedule includes the following savings to the Navy:

1. Total program RDT&E cost is reduced by $153.0 million in then-year dollars. Total cost changes are as follows:

Two Contractors	
Total Cost: Then Year $	889.1M
Single Contractor	736.0M
Savings for Single Contractor	153.0M

2. The advanced development (Demonstration and Validation) phase is shortened [deleted]. With a single contractor, planned completion is advanced [deleted].

3. With a single contractor, there is no gap between Demonstration and Validation phase completion and the full-scale engineering development contract award. With two contractors, a [deleted] gap was anticipated. Overall IOC improvement [deleted].

ASW Standoff Weapon

Senator Stennis: I would like you to compare the FY 1982 requirements for funds by type of activity that were originally planned under competition with the current sole-source position.

Mr. Cann: The FY 1982 obligations will include approximately $37 million for the contractor and approximately $13 million for Navy laboratory support. Under a competitive plan, FY 1982 obligations for Navy laboratory support would be the same (i.e. about $13 million) and the $37 million remaining would be divided equally among the two contractors (about $18.5 million each).

Senator Stennis: What does the decision to proceed with development of this system on a sole-source basis save in terms of dollars and its introduction to operational capability?

Mr. Cann: As I have pointed out in answering your second question, the decision to proceed with sole-source Demonstration and Validation will result in estimated savings of $153.0 million (then-year dollars) in total program costs and will accelerate the initial operational capability date [deleted].

Senator Stennis: In testimony given before this committee in March 1980, the Navy stated, "The FY 1981 budget will fund completion of concept formulation with Defense System Acquisition Review Council I and selection of two differing design concepts for Demonstration and Validation" for the Anti-submarine Warfare Standoff Weapon. Please provide to this committee a summary of the selection process of two contractors that will proceed to the Demonstration and Validation phase, including a competitive "fly-off" demonstration of the concept so formulated for that weapon.

Mr. Cann: The ASW Standoff Weapon Demonstration and Validation source selection was conducted in accordance with established DOD and Navy procedures. In evaluating the four proposals submitted, it became apparent that only one such proposal met all the Navy's needs. This factor, in addition to the cost and schedule savings which I have outlined above, strongly influenced the Navy's decision to enter Demonstration and Validation with a single contractor, vice two. Accordingly the Demonstration and Validation will not be competitive and, although it will include flight testing of the single-selected concept, no other concepts will be tested.

Senator Stennis: How will the $10.6 million in sustaining engineering contract funds be utilized to provide a means to keep together the development contractor teams so that the Demonstration and Validation phase planning can continue.

Mr. Cann: Funding of the winning concept development contractor terminated in October 1980 with submission of the competing concept definition proposals. The sustaining contract will fund continued effort by the winning concept definition contractor, pending award of the Demonstration and Validation phase contract. Award of the Demonstration and Validation contract is subject to Congressional action on the FY 1982 request and to a favorable DSARC I decision.

Senator Stennis: The Navy's FY 1982 revised budget request for the submarine ASW Standoff Weapon includes $25 million to support "increased levels of contractor activity and competition during the Demonstration and Validation phase." How will this competitive "fly-off" establish a broad base-line of data for determining the most responsible technical approach for this $2 billion program? When does the Navy anticipate their "fly-off" will occur?

Mr. Cann: As I have previously indicated, the Demonstration and Validation phase will include initial flight testing of ASW Standoff Weapon advanced development models, but will not include a "fly-off," since there will only be a single concept under test. Identification of the best technical approach has, in effect, already taken place during the concept development competition. The data base to be developed during the Demonstration and Validation phase will support a commitment to full scale engineering development (DSARC II) in April 1984.

SEAFIRE

Senator Stennis: Where do we stand on SEAFIRE which is a shipboard laser illuminator? This has been funded for several years but no funding is requested for FY 1982.

Mr. Cann: The SEAFIRE system, was being developed to provide electro-optical fire control capabilities for Navy surface ships. The primary purpose of SEAFIRE was to provide a shipboard illuminator for the 5-inch semi-active laser guided projectile against both surface and shore targets.

Over the years SEAFIRE has progressively declined in priority, not because the missions have changed, but because of new weapons developments which are changing the manner in which we must meet these requirements.

For surface warfare, the proliferation of anti-ship missiles has extended the range of our surface engagements. If our ships are to survive surface engagements, we must be able to destroy enemy ships at ranges beyond the horizon. HARPOON and TOMAHAWK anti-ship missiles have been developed to provide this capability. Because SEAFIRE provides an illumination capability only well within the visual horizon, it is of lower priority in the Navy allocation of development and acquisition resources.

For shore bombardment, again new technology is changing the nature of warfare. Enemy shore-based weapons, in particular anti-ship missiles, are raising the threat level to such a degree that we can no longer depend on operating our ships close enough to hostile coastlines to visually identify targets to utilize SEAFIRE. We are working to increase our ships' standoff range from defended areas, and our Navy-Marine team must rely more on other types of fire support than ships' guns. We are moving out smartly with a wide range of R&D programs to achieve this. Among these are the AV-8B, F/A-18, HELLFIRE helicopter fire support weapon, CH-53E, the Marines' Mobile Protective Weapons System, Laser and IIR MAVERICK, Land-attack TOMAHAWK and VLS. SEAFIRE is lower priority than these because of the need for gunfire ships to get close enough to the beach to directly illuminate their targets. Likewise, weather, topography, and even the smoke and dust of a battlefield, make the ability of a ship to identify a target visually and illuminate it in an operational situation very limited.

Senator Stennis: The 5-inch semi-active laser guided projectile will complete development this year but would appear to require a shipboard laser illuminator to perform its mission. What are the other alternatives?

Mr. Cann: Laser illumination for guided projectile would be provided by air or ground shore fire spotters.

Senator Stennis: SEAFIRE was to have the capability to operate during conditions of heavy jamming and periods of radar silence. What other alternatives do we have to perform that required mission during these conditions?

Mr. Cann: As previously pointed out, SEAFIRE was being developed as an electro-optical fire control system. There is no alternative development which will perform this mission. However, I again want to emphasize the changing nature of surface engagements, brought about by the advent of surface-to-surface missiles which can far out-range the guns which would be controlled by SEAFIRE, and which has caused SEAFIRE to drop in priority for allocation of resources for its development and acquisition.

Senator Stennis: I understand a cost and operational effectiveness analysis (COEA) was made of SEAFIRE last year. What were the results?

Mr. Cann: There was a study completed in January 1980 which concluded that SEAFIRE, used in conjunction with Guided Projectiles against point targets, would be more cost effective than ballistic ammunition. However, the study didn't take into account either soft targets or area-type, targets, for which ballistic ammunition would be equally as effective and far less costly. It is probable that the number of shore targets for which the SEAFIRE/Guided Projectile combination could be used would be a relatively small percentage of the total naval gunfire requirement. This is due to the increased ship standoff ranges required due to the rising threat, as well as the fact that only a small number of targets are generally within the line-of-sight i.e. not behind sand dunes, tree lines, hills and other obstructions, where SEAFIRE would be of no value. As much as I would like to see SEAFIRE on our ships to deal with some of the particular situations for which it would be useful, the high price tag and other higher priority efforts we must pursue put it lower on our priority list.

Senator Stennis: Is it true that 68 modern surface combatants are already equipped with 5-inch guns and the MK 86 fire control director capable of firing the laser guided projectile, but will not be able to maximize their capability unless SEAFIRE is added?

Mr. Cann: The Navy has developed plans for modifying 65 ships in 6 classes (DD-963, 993, 997, CGN 36, 38, and CG 47) to make them capable of firing the guided projectile. This will involve significant alterations to both the 5"/54 gun mounts and MK 86 fire control systems. Integration of SEAFIRE with the modified MK 86 fire control system would require additional interface and software changes.

Intermediate Water Depth Mine

Senator Stennis: Tell me about your Intermediate Water Depth Mine program. I understand the Navy has recently terminated the demonstration and validation contracts, but still hopes to go forward with the program. What are your plans for restructuring this program?

Mr. Cann: The Intermediate Water Depth (IWD) Mine development and validation contracts were recently terminated after the U.S. Navy determined that the IWD program as it was then structured, with a planned initial operational capability to be achieved [deleted] did not meet the Navy's requirement for a capability [deleted] Moreover, the high development costs of this weapon coupled with known deficiencies in the overall Navy RDT&E program [deleted] tended to make the achievement of a [deleted] IOC somewhat suspect. It is imperative that a mine for use in intermediate water depths be available [deleted] to fill the gap between shallow water coverage afforded by QUICKSTRIKE mines and the deep water ASW coverage provided by CAPTOR mines.

An ad hoc team was formed to structure a program for the Medium Depth Mine (MDM) development as an alternative to the IWD. The team has recently completed its study and its report is being reviewed by the U.S. Navy. It is anticipated that Navy plans for the MDM development will be finalized within the next several weeks.

F-101X

Senator Stennis: Is the Navy still looking at the F-101X derivative fighter engine as a possible re-engine candidate for F-14 aircraft?

Mr. Cann: The F-101X engine is currently undergoing airborne tests in the Air Force F-16, results of which are being monitored by the Navy. Flight testing in the F-14 is scheduled July - September 1981. Future use of the F-101X engine in the F-14 depends on the emerging threat, results of the flight testing, and affordability of F-101X development and procurement.

Senator Stennis: Do you consider it essential to proceed with engineering development of this engine?

Mr. Cann: A Navy decision to proceed with engineering development of this engine will be made after submission of the final F-14 flight test report in December 1981. The decision will center around the greater thrust and projected reliability advantage over the TF-30-P414A engine versus the high cost of buying and retrofitting F-101 engines on all F-14 aircraft.

HXM

Senator STENNIS: Funding is included in the fiscal year 1982 budget to initiate a development program for an HXM medium helicopter with an initial operational capability in the early 1990's. I understand new development proposals as well as off-the-shelf helicopters will be considered. What are examples of off-the-shelf helicopters that could meet the specifications for this competition?

General MOORE: There are no off-the-shelf helicopters that can meet the HXM requirements without modification. The degree of modification depends on the aircraft involved. Examples of aircraft candidates in the off-the-shelf category are:

H-60:	Made by Sikorsky Aircraft and in procurement by the Army as an assault troop carrier and by the Navy (SH-60B) as an ASW platform (LAMPS MARK III). Because of the box size and troop capacity and lack of a ramp for cargo loading, H-60 cannot be a single aircraft solution for HXM. It would be necessary to augment it with additional procurement of a heavier lifter such as the CH-53E, also from Sikorsky, now under procurement by the Navy and Marine Corps. This combined mix of aircraft would require six additional

LHA type ships for an equal force capability because of the numbers of aircraft required and the inefficient deck spotting factors.

CH-46: Last produced by Boeing-Vertol in 1971 and produced only in Japan by Kiwasaki on licenses from Boeing-Vertol. Operated by the Navy for Vertical Replenishment, Search and Rescue, Utility and by the Marine Corps as a primary assault transport. An improved variant of the H-46 could serve as an HXM solution and virtually meet all mission requirements. Significant modifications would be required as well as reinvestment in tooling to re-open the production line.

CH-47: Produced by Boeing-Vertol for foreign and commercial operators. Now in service in significant numbers by the U.S. Army as an assault support, not assault aircraft. The H-47 would require modification for ship operations as it has never been offered in a sea based variant. It is judged as unsatisfactory for the HXM solution as it does not meet the performance requirements, is too vulnerable to the threat and lacks agility to be used as an assault helicopter, and because of size, poses an inefficient ship fit and is not capable of operations from some amphibious and replenishment shipping.

214ST: Produced by Bell Helicopter Company for commercial operators. Has never been offered in either a military or sea based variant. Considered too small, for the same reasons listed for H-60.

SUPER PUMA: Produced by Aerospatiale of France. A product improvement to the Puma and entering service as a commercial aircraft. Under consideration by many Free World countries as a future medium assault vehicle. It is the only Free World helicopter certified for extended flight in icing conditions. Modifications would be required for sea basing. Inadequate performance data is available for a precise determination on the Super Puma's ability to meet the HXM requirement.

EH-101: Westlands of the United Kingdom and Agusta of Italy have announced plans to form a third company known as EHI which would be the producer of a medium helicopter powered by three General Electric engines. The purpose of this effort is to replace SH-3 helicopters used in the UK and Italian Navies for anti-submarines warfare and as commando carriers. The EH-101 is very close to the performance goals expressed for the HXM and it offers an opportunity to share R&D cost, NATO commonality and an early IOC of 1988.

CLIPPER BOW

Senator Stennis: The CLIPPER BOW program leading to an active radar satellite was cancelled prior to advanced development. One of the reasons was that CLIPPER BOW would not have been able to detect and track high speed aircraft. I understand the Navy is now studying an Integrated Tactical Surveillance System (ITSS) as a successor program with $25 million to initiate development in FY 1982. Would you explain how this system will operate and what the Navy hopes to achieve from it. Do you have confidence that the Air Force will join in this development?

Mr. Cann: The Integrated Tactical Surveillance System (ITSS) is a joint (Navy/Air Force) concept development effort that is examining various ways to meet the Navy's critical need for accurate and timely wide area extended range surveillance and targeting data on high interest ships and aircraft. It also addresses the Air Force's North American Air Defense requirements to detect and track incoming bomber raids. No single sensor system, either existing or programmed, can fulfill the above set of requirements.

Three contractor teams are currently developing this concept for a system of systems, which consists of sensing, processing and disseminating elements to provide a commander with near real time, all weather, emission independent, day/night surveillance and targeting of high interest targets.

The three contractors were tasked to investigate available Navy, DOD and National assets and evolve solutions relying on these assets. They were also tasked to consider at least one option involving a space radar of their design. The contractor teams were encouraged to investigate options not including a space radar and are actively and seriously investigating non-space radar alternatives.

The concept development phase will be completed in March 1982. The recommended systems and system architectures will then be reviewed by the services with respect to operational feasibility, technical risk and cost. A recommended course of action will then be referred to the Defense Systems Acquisition Review Council.

SUBCOMMITTEE RECESS

Senator STEVENS. We appreciate that and I apologize to you for not giving the opportunity to finish. Thank you very much, gentlemen. We stand in recess until 9:30, Wednesday, May 6.

[Whereupon, at 10:04 a.m., Thursday, April 30, the subcommittee was recessed, to reconvene at 9:30 a.m., Wednesday, May 6.]

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1982

THURSDAY, MAY 7, 1981

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, D.C.

The subcommittee met at 9 a.m. in room 1223, Everett McKinley Dirksen Senate Office Building, Hon. Warren Rudman presiding.

Present: Senators Rudman and Schmitt.

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE AIR FORCE

PROCUREMENT AND RESEARCH, DEVELOPMENT, TEST AND EVALUATION

STATEMENT OF LT. GEN. KELLY H. BURKE, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION, U.S. AIR FORCE

ACCOMPANIED BY:

- **MAJ. GEN. JAMES H. MARSHALL, DIRECTOR OF DEVELOPMENT AND PRODUCTION, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION**
- **MAJ. GEN. ROBERT D. RUSS, DIRECTOR OF OPERATIONAL REQUIREMENTS, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION**
- **BRIG. GEN. RALPH H. JACOBSON, DIRECTOR OF SPACE SYSTEMS AND COMMAND, CONTROL, COMMUNICATIONS, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION**
- **COL. EDWARD L. UHER, DEPUTY DIRECTOR OF LOGISTICS PLANS AND PROGRAMS, DEPUTY CHIEF OF STAFF, LOGISTICS AND ENGINEERING**
- **MS. BEVERLY J. HOOPER, ACTING DIRECTOR OF COMBAT SUPPORT PROGRAMS DIVISION, DIRECTORATE OF LOGISTICS PLANS AND PROGRAMS, DEPUTY CHIEF OF STAFF LOGISTICS AND ENGINEERING**

BUDGET REQUEST

Senator **RUDMAN**. The committee will come to in order.

We are here this morning to receive testimony on the fiscal year 1982 budget request for Department of the Air Force Research, Development, Test and Evaluation; Aircraft and Missile Procurement; and Other Procurement. We are pleased to have with us today Lt. Gen. Kelly H. Burke, Deputy Chief of Staff for Research, Development and Acquisition and others from the Department of the Air Force.

The amended fiscal year 1982 budget request for Air Force R.D.T. & E. is $9.398 billion. This is an increase of $2.29 billion over fiscal year 1981.

The amended fiscal year 1982 budget request for "aircraft procurement" is $14.7 billion. This is an increase of $4.3 billion over fiscal year 1981.

The amended fiscal year 1982 budget request for "missile procurement" is $4.6 billion. This is an increase of $1.3 billion over fiscal year 1981.

The amended fiscal year 1982 budget request for "other procurement," Air Force is $5.1 billion. This is an increase of $2 billion over fiscal year 1981.

It may be necessary to close the hearing today due to classification of materials to be covered. In that event, if the members of the subcommittee or witnesses will indicate their desire to close the hearing, I will set a time for going into closed session. Most likely this would be for the period of time when a majority of members will be present. If this is the case, those individuals not cleared or having the need-to-know will be required to leave.

We welcome your appearance. You may submit your detailed statements for the record and summarize your oral statements.

General **Burke**. We have submitted some statements for the record, Senator Rudman, that covers the 3600 account, "Research and development" for the Air Force and another for the "Missile and aircraft procurement" that are called the 3010 and 3020 accounts and a third that covers a catchall category that is termed "Other procurement," the 3080 account, and those go into considerable detail.

What I had in mind this morning is a very short overview briefing of sort of how we assign our priorities and on what basis, and in general how that money is distributed. Then we will be happy to answer any questions.

PREPARED STATEMENTS

Senator **Rudman**. We are glad to have you all here this morning. As you stated, General Burke, you will submit your written and prepared detailed statements for the record and summarize, if you will, your other statements. Will there be any testimony that you want to use here this morning that will require us to go into closed session?

General **Burke**. No, sir. We intend to offer our presentations of an unclassified nature and the questions obviously can take classification but that will be your choice.

[The statements follow:]

PREPARED STATEMENTS OF LT. GEN. KELLY H. BURKE
DEPUTY CHIEF OF STAFF
RESEARCH, DEVELOPMENT AND ACQUISITION
HEADQUARTERS, USAF

RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

Mr. Chairman and Members of the Committee:

I am pleased to appear before you to present the Air Force Research, Development, Test, and Evaluation (RDT&E) budget request for fiscal year 1982. This budget is the foundation of the future Air Force. The programs included in the budget were selected after careful review of overall defense needs and represent the minimum Air Force capability required to support national security goals of preserving our independence and territorial integrity and protecting our vital interests.

Clearly, the greatest military challenge we face today is the Soviet Union, since it alone has the capability to directly threaten our survival as a nation. You undoubtedly have or will be given testimony from other witnesses on the seriousness of this threat. The growth in the Soviet Union's military capability, now and in the future, is no accident. It is the result of a consistent and sustained expansion of the Soviet military effort, demonstrating a determined commitment to achieve a military posture second to none.

For example, total Soviet military expenditures are now about 50 percent greater than those of the U.S. Over the last eleven years, Soviet real expenditures have grown at a rate of 3 percent per year, while U.S. expenditures only recently have shown any real growth. Since 1970, our real spending declined at an average of 1.8 percent annually.

Total dollar cost estimates of Soviet military investment (which encompasses procurement, RDT&E, and military construction) during this same period have grown and now exceed comparable U.S. efforts almost twofold. The cumulative Soviet investment since 1970 has outpaced U.S. investment by 350 billion dollars (constant 1982 dollars). Focusing on RDT&E separately, the Soviets have outspent us by about 50 percent. In 1980, their estimated outlays were twice as much as ours, and the gap is projected to widen.

However, estimated defense expenditures are imperfect and imprecise indicators at best because of the differences between U.S. and Soviet military and economic systems. While such estimates are useful comparisons to illustrate relative trends, it is Soviet hardware, capabilities, and the final application of their research efforts flowing from their commitment which form the substantive basis of our concern. For example, the Soviets have and are continuing to outproduce us in almost every category of military equipment. In addition to this growing numerical superiority, the Soviets are fielding systems of increasing quality and sophistication. These advances in weapons technology are rapidly eroding the qualitative superiority that we have traditionally relied upon to offset the quantitative imbalance. Beyond these present-day results, the Soviet commitment also increases the risk of technological surprise--the unexpected appearance of a dramatic and destabilizing advance in military technology.

In sum, the Soviet position has gradually changed from one of military inferiority to one of at least our equal in strategic forces and superiority in general purpose forces. This momentum, if left unchecked, will inevitably result in clear, overall Soviet military superiority and create an atmosphere conducive to increasingly overt

Soviet moves against our interests around the globe. We cannot afford a perception on the part of the Soviet Union, our allies, or other nations that the United States is not able to meet the Soviet challenge.

Our success in meeting this challenge will, to a great extent, depend upon your continuing commitment to a stronger defense budget, of which the Air Force's RDT&E budget is an important part. We are beginning to make progress. Over the past few years, we have had real growth in RDT&E funding, and the fiscal year 1982 request is another strong step forward toward meeting the Soviet challenge. It adds to our momentum from the previous few years and sets the stage for the future.

However, increased funding alone is not sufficient to meet the challenge. We must also choose wisely among the programs competing for RDT&E funds and weed out those which have only limited benefits. We must not become infatuated with technology and gadgetry. Rather, we must continuously focus on the threat and use technology to satisfy critical needs in affordable, supportable, and effective ways. We must continue to strive to manage all of our programs with skill and efficiency. I will discuss some of our initiatives in the management area near the end of this statement. Finally, we must foster more effective armaments cooperation with our NATO and other allies to collectively maximize the return on our investment for defense.

The fiscal year 1982 RDT&E budget request is allocated by mission area. In addition to a section on our management initiatives, the balance of this statement covers each mission area in greater detail, except for intelligence programs which will be reviewed during separate closed hearings. Each mission area discussion briefly addresses the threat, identifies our deficiencies, and highlights the key programs to improve our capability. A complete list of programs by mission area and a glossary of acronyms and abbreviations are included at the end of the statement. Detailed information on each of the fiscal year 1982 programs is provided in the RDT&E Descriptive Summaries.

II. STRATEGIC

About two-fifths of the fiscal year 1982 Air Force RDT&E program is devoted to strategic forces. This emphasis is dictated by the need to maintain a stable deterrence in light of the substantial and increasing Soviet threat. In the remainder of this chapter, I will discuss this threat and describe how we have chosen to respond. A complete listing of Strategic programs is included in Table II at the end of this statement.

STRATEGIC OFFENSE

The fundamental objective of our strategic nuclear forces is to deter nuclear attack or the threat of such attack on the United States, our allies, and others whose security is vital to our national interests. To achieve this objective, we have adopted the strategic Triad concept: a robust, well-balanced, well-hedged, and complementary set of forces that can withstand and respond to a wide range of threats and uncertainties. The Triad consists of submarine-launched ballistic missiles, land-based intercontinental ballistic missiles (ICBMs), and the bomber leg, which includes cruise missiles and supporting tankers. These forces must be capable of surviving a preemptive first strike with a credible counterstrike capability of such magnitude as to deny the Soviets a favorable strategic outcome. The Triad concept has two major benefits. First, it provides confidence that, while the Soviets may be able to develop the capability to destroy or neutralize one leg of the Triad at any given time, they would find the task of simultaneously neutralizing all three legs beyond their capabilities. Second, it forces the Soviets to spread their defensive efforts to counter a wider range of threats, thus denying them the advantage of concentrating their resources on areas more threatening to us. The Triad has served us well in the past and will continue to serve us well in the future if we act promptly and prudently to address the vulnerabilities and deficiencies which are emerging as the threat continues to mount.

At the end of World War II, the United States had unchallenged military supremacy, including a monopoly in nuclear weapons. Since then, the relative balance has shifted dramatically. When the Soviets achieved advantages in most measures of general purpose capability, we were still able to rely on our strategic force superiority to help maintain stability in the world. However, the Soviets have now fielded a strategic force at least equal to ours, making it more likely that they will exploit their advantages in general purpose forces. It should be understood that any imbalance in strategic forces, either real or perceived, provides added fuel for Soviet adventurism and makes meaningful, equitable arms control agreements more difficult. Unless the Soviet momentum is checked, we may witness a decisive shift in the military balance of power in favor of the Soviet Union by the mid-1980s. Such an imbalance, coupled with the Soviets' willingness to exploit it, would make the future even more dangerous and uncertain than the difficult past.

The relative shift in the balance of strategic power is no accident; it has resulted from a determined and sustained commitment by Soviet leaders. A significant disparity has existed for years between U.S. and Soviet spending for strategic forces. Since 1970, the estimated cumulative dollar costs of Soviet strategic force procurement exceeded that of the U.S. by 95 billion dollars (constant 1982 dollars). Our major challenge is to modernize the strategic Triad to maintain its deterrent value in the face of this substantial Soviet commitment to strategic force build up. In short, we must proceed now with a vigorous modernization of our strategic programs.

Our modernization efforts are designed to take maximum advantage of U.S. areas of technological superiority, thus providing an adequate level of deterrence at lower cost. In selecting R&D investments, we must, therefore, give careful consideration to hedging our technological opportunities. We must also consider, as best we can, potential Soviet initiatives and reactions. Underlying these efforts is our desire to provide a firm basis for pursuing our long range national goal of equitable strategic arms limitations.

In the following paragraphs, I will discuss the two legs of the strategic Triad for which the Air Force is responsible--land-based ICBMs and the bomber leg.

Land-Based ICBMs

The most critical and growing deficiency facing us today is the increasing vulnerability of our Minuteman and Titan ICBM forces. These forces, although based in hardened, reinforced concrete silos, have or will soon lose their ability to survive a nuclear attack because of the improved accuracy and increased number of Soviet ICBM warheads being deployed. These warheads have enough yield and accuracy to destroy any fixed target in the United States. Further, they are being deployed in large enough quantities to permit the Soviets to target two warheads on each of our ICBM silos. The result is that the Soviets now have the capability to destroy a large (and growing) percentage of our silo based ICBMs and still maintain a large residual force of weapons.

To redress the vulnerability problem, an advanced, survivable, land-based ICBM is required. M-X fulfills this need by providing a new, highly capable ICBM as well as a new concept in missile basing--multiple protective shelters (MPS). Thus, M-X offsets the growing Soviet threat to our fixed based ICBMs, alleviates a significant and growing asymmetry in future strategic capability, and helps maintain essential equivalence.

The M-X missile is slightly larger than twice the size of the Minuteman III. It will have a payload of 10 independently-targetable reentry vehicles (with a capability of up to 12) and will be more accurate than the improved Minuteman III. Although the basing mode is being reviewed, we have been planning since 1979 to deploy M-X in the MPS basing mode. The MPS concept provides survivability through concealment and mobility of the M-X missile encased in its mobile launcher. Each missile and its launcher would be deployed within a cluster of 23 shelters and can be moved among those shelters to preserve location uncertainty. With a planned deployment of 200 missiles, 4600 shelters will be included in the system. In order to attempt destruction of these missiles, the Soviets would have to target all 4600 potential missile locations. This creates an unfavorable exchange ratio for the Soviets in that they would have to expend at least 23 warheads in order to destroy 10 to 12 of ours. Assuming our forces are near parity, such an attack would be a losing game for the Soviets. Moreover, the number of surviving M-X reentry vehicles can be held constant in the face of larger-than-expected Soviet threats by constructing more protective shelters, more missiles, or, in the extreme, a ballistic missile defense system. In simple terms, the concept of M-X based in MPS is founded on arithmetic, as opposed to technology. Survivability, then, is largely the function of the number of shelters and not the number of missiles deployed. Hence, M-X in the MPS basing mode is well suited to support our long term arms control objective of maintaining a secure, flexible retaliatory capability at significantly reduced force levels.

The M-X is presently in full scale engineering development which includes designing, fabricating, and testing the M-X missile in the MPS basing mode. The program also includes a joint effort with the Department of Energy to develop and use renewable energy systems in providing reliable power for the M-X missile system complex.

In accordance with the Stevens Amendment to the Department of Defense Appropriation Act, 1980, the Air Force has studied various basing design alternatives for M-X which have resulted in program refinements. All of the basing alternatives studied were within the general framework of the MPS concept authorized by President Carter. The conclusion of these studies has been that the basic MPS design for M-X should be retained. However, engineering analysis has identified technical refinements which will reduce the expense and technical complexity of the system while retaining high levels of survivability, military operational advantages, and verifiability. These refinements have been incorporated in the M-X baseline for the fiscal year 1981 program.

Although the overall requirement for the M-X is obvious and compelling, there is concern about the potentially adverse effects that M-X could have on the communities and the environment in the deployment areas. These have been recorded in a draft Environmental Impact Statement (EIS) which was released in December 1980. This document is the third in a series of four planned environmental statements for M-X. The first was an analysis of the old buried trench construction test program; the second addressed full scale engineering development decisions regarding missile design, basing mode selection, and the flight test program; the current one deals with the deployment area selection decision; and the fourth will address the production decision scheduled for mid-1983. The current draft EIS documents the analyses and studies which have been accomplished to identify and compare potential impacts of our proposed and alternative basing locations and identifies the mitigations that are available. Public comment on the EIS is being gathered during a comment period which has been extended from the 45 days required by law to 120 days. This period will end on May 1, 1981, at which time the final EIS will be prepared with careful consideration of the comments received. It is apparent that impacts of M-X deployment will be substantial in many cases, but they are certainly manageable. We are committed to assisting state and local authorities in mitigating these impacts.

As directed by the 96th Congress, we have studied the idea of split basing M-X in more than one candidate basing area. Analysis has proven that only the Great Basin of Nevada/Utah and the Southern High Plains of Texas/New Mexico are reasonable basing candidates. Therefore, we studied implications of dividing M-X basing between the two areas and compared the results to the Air Force proposed action of basing the entire system in Nevada/Utah. Our study, which was submitted to the Congress in January, concludes that there are no overriding environmental, operational, strategic arms limitations, or schedule advantages or disadvantages to split basing. The fundamental difference between the Air Force proposed action and split basing is that split basing would cost 3,475 million dollars more for acquisition and 19 million dollars more for annual operations and support.

Although development of the M-X commands our primary attention, important projects are underway to improve the effectiveness of our Minuteman forces. For example, we are conducting the development work associated with integrating three communications systems into the Minuteman launch control centers to increase the reliability of emergency war order reception and enhance connectivity with higher authority and other strategic forces. Another improvement being developed will allow airborne missile crews to receive alert status information directly from 200 Minuteman IIIs and to remotely retarget those missiles. This new capability will provide more flexibility for the command and control of Minuteman by our airborne crews.

We also see a strong need to maintain some level of advanced systems and technology work for the full spectrum of strategic ballistic missiles. This need is being addressed by the Advanced Strategic Missile Systems program, formerly called Advanced Ballistic Reentry Systems. The objective of this tri-service program is to complete the early stages of development for critical elements of advanced ballistic missile systems. Given U.S.-Soviet throwweight imbalances and the potential for Soviet deployment of improved or expanded anti-ballistic missile defenses, we rely on this program to provide us the capability to upgrade our forces, if needed, to maintain their effectiveness.

The Bomber Leg

The bomber leg of the Triad is also in need of vigorous modernization, and we have already made significant progress. For example, the Air Launched Cruise Missile is in production, and we have begun conversion of the B-52G to a cruise missile carrier. However, Soviet defenses are constantly improving, and we must continue to improve existing systems and develop new ones which are capable of surviving dense and sophisticated defenses.

Our most significant new initiative in this area is the definition of a follow-on Long Range Combat Aircraft (LRCA). The B-52 has been the backbone of the bomber leg of the Triad for more than a quarter century. It has also proven itself in a conventional role in Vietnam. However, the increasing complexity of Soviet defenses makes it imperative that we pursue a new strategic manned aircraft that can be effective against modern defenses in either nuclear or conventional scenarios on a worldwide basis. This new Long Range Combat Aircraft must provide the flexibility and responsiveness inherent in airpower: it must be able to fly long distances, carry large diversified weapons loads, provide a self-contained capability for target acquisition and weapon delivery, defend itself against sophisticated air defenses, and most importantly, provide a platform for on-scene, human judgment throughout the mission.

The Air Force is currently involved in defining the new LRCA consistent with Congressional direction contained in the Department of Defense Authorization Act, 1981. Estimates of development/production costs, schedules, and aircraft performance for candidate aircraft are currently being evaluated as we pursue the initial activities leading to development of a follow-on strategic aircraft. Upon reaching a decision on the appropriate aircraft and its configuration, the balance of our fiscal year 1981 efforts will focus on full scale engineering development tasks.

For most of the next decade, the mainstay of the bomber leg will remain the B-52 force. As cruise missile carriers, we expect these aircraft to remain effective well into the 1990s. To keep the B-52 viable, we are continuing to develop improvements. Our main project is the development of the Offensive Avionics System (OAS) update for the B-52G/H and equipping the B-52G for Air Launched Cruise Missile (ALCM) carriage. The OAS update will correct bombing navigation system reliability and maintainability problems, increase weapon system effectiveness, and provide a launch platform for the ALCM. Other improvements are also being developed or planned, including a new project to protect the option of deploying the B-52H with the ALCM.

To keep the B-52, as well as the FB-111 and other tactical aircraft, current with the substantial and growing Soviet countermeasures threat, we have the Protective Systems program. This program provides for development and test of improved electronic and infrared countermeasures equipment.

We are continuing development of the ALCM, one of the major modernization efforts for the bomber leg. It enhances our bomber's capabilities by providing greater weapons accuracy, increased flexibility for bomber routing and targeting, reduced bomber exposure to defenses, and defense saturation.

To maintain a viable ALCM program, we have the Advanced Cruise Missile Technology program. This program ensures the availability of necessary technologies to increase cruise missile and carrier survivability against the improving Soviet air defense system. It also maintains the momentum of our cruise missile program through propulsion development, advanced technology airframes, and generic technology efforts on structure, fuels, guidance, and radar signature reduction.

The Soviet Union Airborne Warning and Control System (SUAWACS), in conjunction with look-down, shoot-down interceptors, will pose a very serious threat to the bomber leg by the mid-1980s. The Counter SUAWACS Technology program is examining various alternatives to handle this threat, including electronic countermeasures, communications jamming, decoys, and air launched missiles. We are evaluating these alternatives and will recommend a cost-effective mix of techniques for actual development.

Tanker aircraft are a vital part of the bomber leg, and they support our conventional forces as well. The KC-135 Squadrons program provides the development base for modernization of the KC-135 tanker aircraft. It contains several projects intended to increase the capabilities of our aerial tankers. The major effort, however, is to improve the performance of the KC-135 by reengining the aircraft with CFM-56 modern technology engines. Reengining will not only help to alleviate a serious and growing tanker shortfall, but will also significantly reduce noise and environmental impacts of the KC-135A and offset the high and growing costs of operating and maintaining the aging engines.

STRATEGIC DEFENSE

Strategic defense is an integral part of our strategy of deterrence. In particular, timely and reliable warning and assessment of an attack are essential to our nation's leadership and our military forces. Such warning and assessment increase the survivability of our retaliatory and command, control, communications, and intelligence resources and add credibility to our statements that the Soviets cannot be certain of finding our ICBMs still in their silos during any first strike attempt. The latter is of obvious importance as our current ICBMs become increasingly vulnerable.

Therefore, we are supporting Strategic Defense programs which provide warning and assessment of missile or bomber attack on North America, permit control over our sovereign airspace, warn of an attack on U.S. space systems, give us a hedge against future defense requirements, and enhance the survivability of our strategic forces, industrial base, and population in the event of a major nuclear war. These key objectives are addressed within the four elements of our Strategic Defense mission area: Atmospheric Warning and Defense, Missile Surveillance and Warning, Space Surveillance and Defense, and Other Strategic Defense.

Atmospheric Warning and Defense

Atmospheric warning and defense, which provides tactical warning, active defense, and airspace control, must be emphasized because of the increasing quality and quantity of Soviet bombers. We are concerned about existing Bear and Backfire bombers and the development and future deployment of an advanced Soviet bomber which could possess increased strategic capabilities, to include cruise missiles with extended ranges. Our existing systems are not adequate to counter this threat. For example, existing North American bomber/cruise missile sensors have coverage gaps, can be underflown, and do not reliably detect targets with small (cruise missile) radar cross sections. Based on our limited capabilities to provide adequate warning and the growing Soviet threat, there is an urgent need to modernize our warning systems to correct deficiencies associated with age and limitations in coverage.

Important initiatives we are taking include the SEEK IGLOO program and the CONUS Over-the-Horizon Radar. In Alaska, the SEEK IGLOO program will replace existing radars with minimally attended and technologically improved radars. This will provide considerable cost savings and will improve our ability to differentiate small targets from the atmospheric background.

To correct coverage deficiencies, we need to complement the line-of-sight and range limited capabilities of our current systems with systems which can provide wide-area, long-range, and all altitude tactical warning of atmospheric attack. Accordingly, we are continuing with development of the Over-the-Horizon Backscatter Radar to provide long-range surveillance of aircraft and warning of bomber attack along the coastal approaches to North America. In addition, we are pursuing tests to see whether Over-the-Horizon Backscatter Radar will provide satisfactory tactical warning along northern approaches to North America. We are also beginning to evaluate space-based systems for future requirements.

Missile Surveillance and Warning

It is imperative that timely and reliable warning and assessment of a ballistic missile attack be provided to the National Command Authorities so that an appropriate response could be selected. We are working on missile launch warning, attack assessment, and nuclear detonation reporting systems and the means of processing this data to ensure that the information is available where and when required. Central to this effort is providing, with a high degree of confidence, warning of missile launches from both known and potential enemy missile launch areas. A collection of ground-based radars is used to ensure an accurate cross-check of missile launches detected by our space-based sensors and to provide additional information about the attack. We have begun to upgrade our Ballistic Missile Early Warning System to ensure reliable operation and to increase both its capacity and accuracy.

Because of the importance of understanding the specific nature of less than all out missile attacks--for example, a precursor strike or limited attack--we are improving the resolution of our missile surveillance systems to go beyond providing simple warning of an attack. We want to be able to assess, with some precision, what kind of attack is in progress so that our selected response is appropriate and would not needlessly escalate the conflict. To achieve attack assessment, we are investigating the potential for more precise object tracking and improved processing of the data from our missile surveillance sensors to provide upgraded pre-impact and transattack assessment information. Transattack and postattack assessment information will be provided when the Integrated Operational Nuclear Detonations Detection System becomes operational.

To improve our space-based warning and attack assessment capabilities, we are pursuing two programs which support a follow-on missile surveillance system that will provide more complete attack assessment information. The objective of Missile Surveillance Technology is to collect and analyze infrared phenomenology associated with the earth background and with strategic missile plumes. The second program, Advanced Warning System, is a joint Air Force/Defense Advanced Research Projects Agency program which develops the required technologies for the follow-on system.

Space Surveillance and Defense

Over the last decade, Soviet space launches have greatly exceeded those of the United States, launching an average of three and one half satellites for each one we launch. The growth of Soviet space capabilities in jamming and antisatellite activities is especially troubling since we, as well as the Soviets, are becoming increasingly dependent upon space systems. In the face of proven Soviet capabilities, we are taking prudent steps to defend our satellites. Our space defense program consists of four elements.

The first element focuses on deterring an attack by improving our ability to monitor space activities. Surveillance is the key to our warning and defensive options. In our Space Surveillance Technology and SPACETRACK programs, we are pursuing interim solutions to several significant deficiencies. For the far term, our efforts are directed toward a space-based system which will reduce or eliminate overseas basing problems of SPACETRACK sites and eliminate significant coverage gaps.

The second element of our space defense program would make our satellites less vulnerable to attack. In the Satellite Systems Survivability program, we are identifying defensive countermeasures which will increase the survivability of our own satellites and their communication links.

In the third element of our program, we will continue the prototype development of an antisatellite capability to destroy enemy military satellites that represent a threat to our forces. This is the primary thrust of our Space Defense Systems program. As you know, the Soviets already have an operational antisatellite system that is effective against our lower altitude satellites.

The fourth element provides the vital command, control, and communications to effectively manage all space defense resources. As we aggressively improve our space defense elements, an effective command and control system is essential for these elements to be employed in an integrated and coordinated manner. The North American Air Defense Combat Operations Center program will develop the Space Defense Command and Control System in a phased approach to support the evolving space defense elements.

Other Strategic Defense

This element of the Strategic Defense mission area includes the Defense Support Program, a key element of our nation's strategic defensive posture. This program provides data to the National Command Authorities, North American Defense Command, and Strategic Air Command. Our RDT&E efforts are aimed at increasing the survivability of operational data through the development and deployment of truck-mounted Mobile Ground Terminals, improving performance and lifetimes of follow-on satellites, and ensuring that follow-on satellites are compatible with the Space Shuttle.

III. GENERAL PURPOSE

The loss of U.S. strategic nuclear superiority has reduced the deterrent value of the nuclear umbrella at lower levels of conflict. Therefore, we must rely upon strong, capable general purpose forces to deter conflicts short of nuclear war and to respond with conventional forces against threats to our interests.

These general purpose forces must be able to deal with a wide range of potential threats that are constantly changing. In such an environment, military and civilian planners and strategists need flexibility in their options. Flexibility is and always has been the hallmark of tactical airpower. Flexibility is the result of many factors: tactics, training, availability, and quantity, but especially the capabilities we design into our weapon systems.

The primary threat to our general purpose forces continues to be the Soviet Union/Warsaw Pact. The most imposing problem that we and our allies face is the numerical advantage enjoyed by the Soviet Union/Warsaw Pact forces. Western strategy relies heavily on maintaining technological superiority and fielding high quality weaponry to offset their quantitative advantage. However, increased emphasis on the part of the Soviet Union to expand their military capabilities is rapidly shrinking the significant U.S. qualitative advantage which prevailed in earlier years.

Accordingly, we are placing even greater emphasis on technological solutions to satisfy mission requirements and increase readiness at affordable costs. To this end, we are pursuing a carefully selected set of general purpose programs which best utilize the flexibility, massive firepower, and relatively quick response offered by tactical airpower in satisfying our most urgent needs/deficiencies. These programs take into consideration the contributions of our allies, the need for a balance between modernization and readiness, the requirement for affordable and cost-effective programs, and a reasonable degree of concurrency in development and production to shorten the acquisition cycle while assuming prudent risks.

Our General Purpose programs are categorized into five mission areas: Air-to-Surface Attack, Counterair, Defense Suppression, Reconnaissance, and Mobility. I will cover each area by reviewing the threat and discussing the key programs we have underway. A complete listing of General Purpose programs is included in Table III at the end of the statement.

AIR-TO-SURFACE ATTACK

One of the most demanding conventional threats the United States must be prepared to counter is an armored attack on Western Europe by the Warsaw Pact. Soviet strategy calls for around-the-clock operations designed to cause the quick collapse of NATO forces. The Soviets have stated openly that they intend to seize the initiative early. If NATO forces are in defensive positions, the Soviets most likely would launch a classic breakthrough attack to establish their preferred form of combat--a war of movement. Soviet doctrine requires that their forces move as rapidly as possible; therefore, operations at night and in bad weather are considered a natural extension of day operations. Their intent is to keep NATO forces off balance and confused. The Soviets have structured their forces this way, and they have equipped and trained them accordingly.

To counter this demanding scenario, NATO depends heavily on the flexibility of tactical airpower to be able to shift combat power rapidly to threatened sectors. In turn, the Soviets have reacted by equipping their forces with the most dense, lethal air defense system ever assembled. In addition, they are fielding improved systems to take advantage of night and bad weather conditions--conditions where tactical airpower's effectiveness is reduced.

One of our most serious deficiencies is the inability to attack targets, especially armor, at night and in weather. We have studied this problem extensively and, based on current technological assessments, have concluded that we must correct this deficiency incrementally. In the near term, we are capitalizing upon recent technological breakthroughs which will allow us to deny the enemy the sanctuary he currently enjoys at night and under-the-weather. This is the focus of the Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN) project. Concurrently, we are investigating technologies which can expand upon the LANTIRN capability to include attacking targets in weather or in other conditions of reduced visibility. We have separated these development efforts into the Night/Precision Attack Program which focuses on LANTIRN and the Night Attack Program which concentrates on the remaining development efforts.

To deal with the disadvantage in numbers and the dense defenses of the Warsaw Pact, we are emphasizing improved weapons that achieve much higher effectiveness through accuracy and lethality, while reducing aircraft attrition through limiting exposure or standoff.

The Advance Attack Weapons and Wide Area Antiarmor Munitions programs provide for development of a family of area munitions, dispensers, warheads, and guidance systems to satisfy the requirment for a multiple armor kills per pass capability in all-weather conditions and for delivery from aircraft at minimum altitudes. This capability is required to blunt the Warsaw Pact massed armor threat by interdicting second echelon forces before they can reinforce first echelon forces to support a breakthrough. Weapons under development are the Antiarmor Cluster Munition, the Extended Range Antiarmor Munition, and Wasp Minimissile.

The Air Launched Assault Breaker and PAVE MOVER programs will develop the technology for a non-nuclear, standoff weapon system capable of engaging multiple, second echelon ground targets, especially armored ones. Their primary missions are to delay, disrupt, or destroy massed Warsaw Pact ground forces maneuvering for a breakthrough. Additionally, they must be able to accomplish this mission in a dense electronic countermeasures environment, during all visibility and weather conditions, and in near real time. The system is planned to employ missiles carrying a payload of multiple unpowered submunitions, each with a target seeker The missiles are guided over the target array by the airborne PAVE MOVER radar/fire control system. PAVE MOVER will also be used to vector penetrating aircraft to the target for delivery of advanced munitions, such as Wide Area Antiarmor Munitions, and can provide the theater commander with wide area, near real time data for battle management.

We are also developing improvements to existing weapons. The Low Level Laser Guided Bomb (LLLGB) program will expand the LLLGB launch envelope to reduce aircraft attrition and enhance tactical flexibility. It will also improve LLLGB target acquisition capabilities under conditions of limited visibility which are common to Europe. In the Close Air Support Weapon System program, we are developing an imaging infrared version of the Maverick missile to expand our ability to destroy small, hard targets during night and under-the-weather conditions. Similarly, in the Surface Defense Suppression program, we will integrate the Maverick imaging infrared seeker with the GBU-15 to extend the effectiveness of this standoff weapon.

A new standoff weapon under development is the Medium Range Air-to-Surface Missile (MRASM). MRASM, a conventionally armed cruise missile, will give aircraft the capability to engage critical, high value, heavily defended targets while standing off beyond the lethal range of enemy air defenses.

We are continuing to develop the Ground Launched Cruise Missile (GLCM) to enhance our theater nuclear forces. GLCM, a surface-to-surface missile, is a variant of the Tomahawk cruise missile. The requirement for GLCM stems from emerging trends which have caused concern among the NATO Allies about the credibility of the Alliance's nuclear deterrent. First, there has been the adverse trend in strategic nuclear forces which I mentioned earlier. Second, the Soviets have strengthened their long-range theater nuclear forces significantly through the deployments of the SS-20 ballistic missile and Backfire bomber. In response, the Alliance reached a collective decision in 1979 to adopt a combined program of long-range theater nuclear forces modernization and arms control on behalf of NATO. Under the terms of this program, the Alliance will move ahead with deployments of the Army's Pershing II ballistic missile and the Air Force's GLCM, while simultaneously advancing theater nuclear arms control proposals.

In the Air-to-Surface mission area, we are also concerned with our tactical fighter force, and we are developing improvements to the F-16, A-10, and F-111 to meet the expanding capabilities of the Warsaw Pact. The Warsaw Pact is actively supplementing or replacing its older, less sophisticated, day visual fighters with new aircraft featuring increased range, maneuverability, and acceleration, coupled with improved avionics and advanced fire control systems providing all-weather capabilities. This improved fighter capability, in concert with ever improving air defense and electronic warfare capabilities, presents a formidable challenge to the Air Force.

Our major aircraft improvement program relates to the F-16. The F-16 has outstanding air-to-air and air-to-surface capabilities; however, several key capability improvements are required. For example, the F-16 has limited night/in-weather attack capabilities and has no radar missile. Therefore, our efforts support the the integration of LANTIRN and the Advanced Medium Range Air-to-Air Missile (AMRAAM) and the development of radar improvements.

Although the F-15 is our premier air superiority fighter, it also possesses the potential for excellent air-to-surface capabilities and, with conformal fuel tanks, offers significant range/payload advantages over most existing aircraft. We are requesting funds to initiate development of improvements to enhance the F-15's strike/attack capabilities, while retaining all current air-to-air capabilities.

With regard to far term needs, we see a requirement to deploy an advanced tactical fighter by the mid-1990s. This requirement is based on the need to eventually retire older aircraft such as the F-4 and the F-111, the need to counter evolving Soviet aircraft capabilities which will probably negate our qualitative advantage, and the need to enhance aircraft survivability in light of the ever growing threat. Because of the long lead times necessary to develop and field new aircraft, we must begin now. Accordingly, we are proposing two programs to respond to this need. First, under the Advanced Tactical Fighter program, we will initiate concept development for our next generation tactical fighter. Maximum industry participation will be encouraged. Secondly, we will initiate the Combat Aircraft Prototype program to mature new technologies that will allow us to introduce advanced concepts in our Advanced Tactical Fighter. Flight test aircraft will be developed to evaluate promising technologies. The program will also reduce the gap between the emergence of new technologies and their operational introduction.

COUNTERAIR

Over the last few years the character of Soviet tactical air has changed from primarily a limited range defensive force to a formidable offensive force. They now have the capability to conduct fully supported strikes against targets anywhere in European NATO. The Soviets and Warsaw Pact have several fighter production lines in operation, and with continued high production rates, they are rapidly modernizing and expanding their tactical capabilities.

Our fleet of fighters is still the finest in the world, but the Soviets are closing the lead. They are forecast to field an advanced air superiority fighter with radar capabilities similiar to our present generation F-15's and with energy maneuverability characteristics similar to our F-15 and F-16's. We also have superior air-to-air missiles; however, a new missile is expected soon which will give their aircraft an operational look-down, shoot-down capability.

Our RDT&E emphasis is on increasing the air-to-air capabilities of our current fighters through the 1980s. Our mid-term efforts center on development of the Advanced Medium Range Air-to-Air Missile (AMRAAM) which will satisfy the Air Force, Navy, and NATO requirement for a new generation air superiority air-to-air missile with significant improvements in operational utility and combat effectiveness over current systems.

In our fighter programs, we will continue to develop better fire control capabilities to improve mission effectiveness. I previously discussed F-16 improvements. We are also supporting radar improvements and AMRAAM integration for the F-15. In addition, we are conducting conformal fuel tank certification on the F-15. The conformal fuel tanks will greatly increase the F-15's responsiveness and flexibility, as well as increase combat mission radii by 30-70 percent.

We are also stressing the development and integration of our beyond-visual-range identification technology into aircraft systems, since such a capability is essential to full exploitation of AMRAAM capabilities. Our identification developments are accomplished in the Air-to-Air Identification and Aircraft Identification programs.

In the Counterair mission area, we consider more than just destruction of enemy aircraft in one-to-one aerial combat. In addition, we are exploring concepts to attack and deny the enemy's use of airfields and to destroy his aircraft on the ground. One example mentioned earlier is the development of MRASM, a cruise missile suitable for airfield attack. We are also proposing to continue the Low Altitude Airfield Attack System, a joint U.S./United Kingdom development for runway destruction and denial.

DEFENSE SUPPRESSION

Soviet air defense systems continue to grow in density, quantity, and complexity as the Soviets develop and deploy new tactical and strategic air defense systems. These new systems emphasize mobility and the use of both radar and electro-optical means for target acquisition and tracking. Growth in their air defense capability has also been marked by increased reliance on command, control, and communications (C^3) as they strive to maintain a highly reliable, efficient, and integrated system.

Because of this growing threat, we have and will continue to place considerable emphasis on defense suppression. Our objective is to achieve an effective mix of systems which degrade, deceive, or destroy the enemy's air defense network in order to ensure the survivability of our aircraft and aircrews in the modern combat environment. To accomplish this, we have programmed updates for our operational defense suppression systems as well as stressed the development of several new systems to handle the highly sophisticated Soviet threat.

Today, our primary system for destruction of tactical emitter systems such as air defense radars is the F-4G Wild Weasel. We have programmed funds to develop an update to this system to keep pace with the evolving threat. We are also continuing with the Navy in the joint development of the High Speed Anti-Radiation Missile, which will greatly improve the lethality of the F-4G. In addition, under our Expendable Drones program, we plan to expand our kill capability through the use of relatively low cost expendable drones (Locust) being developed jointly with the Federal Republic of Germany.

The primary program for improving our long term strike capability is the Precision Location Strike System (PLSS). PLSS will offer us the unique capability to precisely locate and strike time-sensitive threats and key command and control elements. Its purpose is to allow our forces to operate more effectively and to reduce attrition to acceptable levels, especially in the critical first few days of conflict.

On the electronic warfare side, we are emphasizing both support and self-protection electronic countermeasures (ECM). For support jamming, we will continue the EF-111A improvements in order to counter the Soviet early warning, ground control intercept, and acquisition radars. For self-protection ECM, we will continue developments under the Tactical Protective Systems program to make the ALQ-131 ECM pods current with the threat. Additionally, we are reducing the proliferation of electronic warfare equipment, an earlier Congressional concern, through the joint development with the Navy of the Airborne Self-Protection Jammer for the F-16.

Since the Soviets are relying more on the C^3 networks for effective battlefield management, we are placing heavy emphasis on tactical C^3 countermeasures to counter their networks. Specifically, as part of our Tactical C^3 Countermeasures program, we are developing a new jammer for the EC-130H Compass Call aircraft which will provide us with a standoff C^3 jamming capability.

RECONNAISSANCE

Reconnaissance and surveillance systems provide decisionmakers at all levels with the tactical information and intelligence required to minimize the likelihood of surprise and to plan, move, and counter enemy initiatives. These same assets assist in interdiction by locating key targets on the battlefield. Therefore, the development and deployment of these systems is critical to the credibility of NATO defense of Europe and to general U.S. combat capability wherever and whenever it might be employed. Without reconnaissance, even our best weapon systems are ineffective if employed at the wrong place and time.

Our reconnaissance RDT&E efforts focus on increasing the timeliness and accuracy of intelligence information required by battlefield commanders to offset the superior numbers of opposing forces and weapons. To meet current needs in timeliness and accuracy, our planned program includes the continued development of improved sensor and ground processing capabilities.

To satisfy our needs for detailed accuracy under all-weather conditions, we are continuing the Side Looking Airborne Radar program to develop the Advanced Synthetic Aperture Radar System (ASARS) for the U-2R and TR-1 aircraft. To make maximum use of ASARS, we are also developing the exploitation system and the ground equipment that will receive the data-linked imagery.

In fiscal year 1982, we will initiate the Advanced Tactical Air Reconnaissance System program, a development effort to define a survivable, day/night, all-weather penetrating reconnaissance capability. This program, coupled with sensor developments in our Reconnaissance Equipment program, will provide the tactical reconnaissance capabilities needed to meet the threat anticipated for the future.

MOBILITY

To protect our global interests, the United States chooses to deploy some forces forward, to preposition limited amounts of material, and to maintain the majority of our forces and supplies at home. These home based forces, supported by mobility resources, serve as a centrally located strategic reserve which can be projected anywhere in the world to deter or resist aggression. Airlift is the most visible, responsive, and flexible element of our mobility resources. Its primary role is to project and sustain combat forces until other means of transportation can deliver the required follow-on support. In many situations, airlift is the only means of responding rapidly, because of either the geographic location or the speed with which the threat develops.

For years we have known that our airlift assets were inadequate to fully meet the requirements of both general conflicts and regional contingencies. Our most pronounced shortfall lies in our capability to airlift outsize equipment such as mechanized artillery pieces, infantry fighting vehicles, and tanks. This shortfall becomes more critical as warning times grow shorter and Army combat equipment becomes larger and heavier.

To expand our capability to carry outsize cargo over long ranges, we are continuing development of the C-X. It will be a wide bodied cargo aircraft capable of operating over intercontinental ranges into small, austere airfields worldwide and capable of airlifting all the essential firepower and support equipment of U.S. forces. The C-X, combined with the other programmed airlift and mobility efforts, will provide the flexibility and capability needed to implement our military strategy.

To extend the service life of the free world's only aircraft presently capable of transporting outsize cargo, we are also strengthening the C-5A wing. The wing modification of this essential aircraft will ensure the continued availability of the C-5 force by providing a 30,000 hour wing service life compatible with the service life for the remainder of the aircraft structure.

Although not directly related to airlift, we include the combat rescue force in the Mobility mission area. Modernization of the Aerospace Rescue and Recovery Service and the Special Operations Force must begin at once to cope with increasing threats and to overcome problems resulting from obsolescent equipment. Therefore, in our Combat Helicopter Modernization program, we are proposing to develop a derivative of the Army UH-60 Black Hawk--a helicopter of proven reliability, maintainability, and survivability. Using the basic H-60, we will integrate equipment and improved avionics required for Air Force missions.

IV. SPACE

Our military forces have become heavily dependent on the information derived from space systems. Effective operations on the modern battlefield are increasingly a function of surveillance, warning, communications, meteorological, and navigation support obtained from satellites. The programs in the Space mission area provide the launch and orbital support for these vital space systems and include space programs not allocated to other mission areas. A complete list of our programs is included in Table IV at the end of this statement.

The Soviets are well aware of the military utility of operating in space and have committed significant resources toward a sizable space presence. Over the last decade, Soviet space launches have exceeded those of the U.S. by a factor of three and one-half to one.

The majority of these launches have been for military purposes. Some of this difference is due to Soviet satellite design--Soviet satellites are generally less reliable than ours and, hence, are shorter lived. The Soviets are also supporting an active man-in-space program, and they have deployed and continue to test an operational antisatellite capability.

On the other hand, we are concentrating our efforts on doing more with each launch. We are supporting the development of a new space launch capability; we are improving our space operations capabilities, and we are providing an advanced technology base for future space system opportunities.

Our future space launch capability, the manned, reusable Space Shuttle, is being developed by the National Aeronautics and Space Administration. The Shuttle will provide major new capabilities which will make our operations in space more effective, and we are taking the necessary actions to transition our spacecraft to Shuttle launch. By the mid-1980s, we will be nearly totally dependent on the Shuttle for supporting our national security space missions.

The Air Force has two major efforts underway that are crucial to the Shuttle program. We are developing the Inertial Upper Stage to deliver spacecraft from the Shuttle to high altitude orbits. Also, we are constructing the Shuttle launch and landing facilities at Vandenberg AFB, California, so that polar and near polar launches can be conducted in support of all Shuttle users--civil as well as military.

The importance of our payloads to national security makes it essential that we maintain our current space booster capability during the period when we plan to transition our spacecraft to Shuttle launch and to provide a back-up capability in the event of delays or any unanticipated problems in Shuttle availability. These capabilities are being supported by our Space Boosters program.

We are also developing improvements to our space operations capabilities. A severe limitation for our current space operations is the antiquated computer system used by the Satellite Control Facility (SCF) to support on-orbit satellites. The SCF Data System Modernization program is a major effort to correct this problem and will give us the ability to support more sophisticated satellites. In addition, we are continuing work on a new Consolidated Space Operations Center. This facility will provide the required support for satellite control functions in conjunction with the Satellite Test Center. It will also provide Space Shuttle operations planning and control capabilities for DOD Space Shuttle missions, as well as provide a back-up capability to the NASA control facility at the Johnson Space Center.

The Air Force is committed to maintaining the technical superiority of our space systems through continual testing of new concepts and by investigating the effects of the space environment on our systems. The tri-service Space Test Program (STP) supports this effort by providing the spaceflights for DOD experimental payloads. STP simplifies the experimenter's job by centralizing management for the many tasks that are required to launch a payload. Furthermore, STP has been designated by DOD to lead in developing an important facet of the Space Shuttle--its use as a manned space laboratory. By taking full advantage of man on the spot, we should be able to accelerate the rate at which we can incorporate new technology into our space systems and make significant strides toward effective manned control of our space systems from space and on-orbit repair of space systems.

V. COMMAND, CONTROL, AND COMMUNICATIONS

Command, control, and communications (C^3) systems are essential to the implementation of strategy, control of forces, and employment of weapons in modern warfare. These systems support day-to-day operations, rapid assessment of indications and warning information for decision makers in periods of tension and impending conflict, accurate situation monitoring and allocation of resources in crisis situations, and the conduct of military operations in wartime. In response to our dependence on C^3, the Soviets place heavy emphasis in their doctrine on the disruption of our C^3 links. The threat includes physical, electronic, and electromagnetic attack to achieve this disruption.

Our C^3 development efforts have three principal objectives. Our primary objective is to counter the growing threat with increased survivability, security, and jam-resistance of our C^3 links. Achievement of this goal will require more complex systems. A second fundamental aim of our RDT&E efforts is to improve both the reliability of our systems and their capability to interoperate with each other. Our final thrust in C^3 is to exploit new technological concepts such as space-based laser communications which could prove feasible and cost-effective in meeting future threats and requirements.

C^3 programs cover a broad range of strategic, tactical, and general purpose systems. The most important of these are highlighted in the following paragraphs. A complete listing of C^3 programs is shown in Table V at the end of this statement.

A primary program for command and control of the Single Integrated Operational Plan forces and other nuclear capable forces is the Air Force Satellite Communications (AFSATCOM) System. The AFSATCOM system consists primarily of communications packages, called transponders, that share the Fleet Satellite Communications (FLTSATCOM) System and the Satellite Data System spacecraft with other missions and terminals located on the ground and in aircraft. Our AFSATCOM efforts are focused on the development of AFSATCOM terminal equipment, operational tools for managing the AFSATCOM network, and the super high frequency (SHF) communications equipments that will be carried on the Defense Satellite Communications System (DSCS) III spacecraft and installed in the missile launch control facilities. These SHF equipments will provide a communications link that is more resistant to both jamming and to nuclear weapon effects. In addition, we are developing improvements to the capability of the command post aircraft to communicate with nuclear weapon storage sites in Europe.

The Satellite Data System (SDS) is a major part of the AFSATCOM system. SDS satellites, using AFSATCOM transponders, provide critical two-way transpolar command and control communications for our nuclear capable forces. In the future, the Satellite Data System will become the backbone of the AFSATCOM system as the Navy's FLTSATCOM satellites begin to reach the end of their useful lives. Our RDT&E program is designed to sustain the operational utility of the Satellite Data System. It consists of transitioning the SDS to the Space Shuttle and improving the jam-resistance of the AFSATCOM payload.

Our existing tactical communications systems have a number of critical deficiencies. Chief among these is their susceptibility to enemy jamming. Accordingly, we are taking action to add jam-resistance to our tactical voice communications network. We are now deploying the HAVE QUICK system to provide a near term jam-resistant voice capability. At the same time under our Advanced Communications Systems program, we are using more advanced technology to develop a system which will be less sensitive to evolving jamming technology. This system, SEEK TALK, will be produced and deployed as HAVE QUICK becomes vulnerable to new jamming techniques.

In addition to jamming susceptibility, other major deficiencies of existing tactical communications systems include delays in passing time-critical information through communication system nodes and the lack of a common set of reference points to coordinate the tactical air battle. Although much combat information is suited to voice channels, aircraft controllers and voice links can become saturated when voice is relied upon as the sole means of real time communications in a tactical theater. Studies have shown that certain elements of data, such as friendly and hostile air tracks, are passed more efficiently over digital data links. We are developing the Joint Tactical Information Distribution System (JTIDS) to correct these deficiencies. JTIDS provides jam-resistant, secure communications between force elements using a high volume, high speed digital data link which allows command and control nets to share more information. Also, each JTIDS terminal can compute its position relative to other terminals, thus providing location and identification of all participating platforms as well as an on-board navigation capability.

The operational E-3A Airborne Warning and Control System (AWACS) aircraft provides mobile, survivable, jam-resistant, wide area radar surveillance along with highly sophisticated data processing, data relay, and communications capabilities. We are currently producing a U.S./NATO standard configuration E-3A, which integrates JTIDS, a maritime radar, and a larger computer into the basic core E-3A. Additional improvements are needed to keep the system effective and to correct deficiencies revealed by operational experience. Improvements underway or planned include development of additional situation display consoles, additional radios, a command console, and electronic counter-countermeasures to ensure continued effectiveness in the projected threat environment.

The Defense Satellite Communications System (DSCS) is a maturing, evolutionary Department of Defense system developed to provide super high frequency satellite communications for secure voice and high data rate transmissions. DSCS satisfies our military command and control, crisis management, early warning detection data relay, treaty monitoring and surveillance information, and diplomatic traffic. Our RDT&E efforts relate primarily to developing DSCS III satellites to replenish existing DSCS II satellites. These replenishment satellites will provide increased channelization, flexibility, and electronic counter-countermeasure capability. In support of our nuclear capable strategic forces, they will also include an ultra high frequency and, eventually, a super high frequency capability for emergency war order dissemination and force execution.

The concepts, techniques, and technologies for future generation military satellite communications systems capable of surviving in the expected intense electromagnetic jamming environments of the future are formulated and developed in the Advanced Space Communications program. This is the major DOD program for providing the necessary research and development activities for future communications satellite systems that will support the combat forces of the Army, Navy, and Air Force. Our development activities include efforts in laser communications and in advanced airborne terminal and satellite technologies required for jam-resistant operations. In addition, because of the broad range of threats, including jamming, physical attack, nuclear effects, and sabotage, we are investigating alternative satellite communications architectures to satisfy future requirements. In recent years, we have proposed the Strategic Satellite System to satisfy the future strategic communications requirement by eventually replacing the AFSATCOM System. Based on Congressional concerns and pressing needs for satellite support of Army, Navy, and Air Force tactical communication requirements, we are working with the other services, under OSD leadership, to define a military communications satellite architecture which will satisfy the highest priority needs of all the services for command and control of both nuclear and nonnuclear forces. Our fiscal year 1982 request includes funds to carry us through concept definition for a multipurpose satellite system. Any new start that results from this effort will be proposed as a separate program in fiscal year 1983.

Successful military operations require a knowledge of the location of force elements. Location information aids commanders in coordinating tactics and maneuvering forces to critical points on the battlefield. Furthermore, if extremely accurate, it ensures that we can deliver effective first round fire on the enemy. We are developing the Navstar Global Positioning System to meet these requirements by providing users in all services with accurate position information on a 24-hour, global basis under all weather and visibility conditions.

VI. TECHNOLOGY BASE

Technology Base is the foundation of our future combat capability. These research and development programs provide technology options from which to assemble effective, affordable, and supportable weapons systems. They enable us to maintain military technological superiority and protect us from technological surprise. They are our investment in the future.

To give you a better understanding of the scope and relevance of the Technology Base work that we do, I will precede my description of the work we plan for fiscal year 1982 in each functional area by giving a sampling of the many concrete and significant results we have obtained and then by providing a brief review of selected major programs, several of which are new starts.

ACCOMPLISHMENTS

Our Technology Base programs produce new devices, concepts, techniques, and hardware which are our "systems menu" for future combat capability--and among which are the seeds of tomorrow's breakthroughs. What follows is a representative sampling of the many specific results that we obtain each year. Recently, we we have:

a. Built a one-megabit magnetic bubble memory chip, a four-fold improvement over existing devices.

b. Successfully transitioned materials, structures, and propulsion technology into the M-X baseline system, increasing payload by 1700 pounds or 30 percent.

c. Developed the cast aluminum structures technology which reduced the Air Launched Cruise Missile fuselage cost by 30% over the initially specified conventional construction.

d. Transitioned to full scale engineering development infrared decoy flare for our bomber fleet. The new flare accurately simulates the infrared emission of a jet engine and is much cheaper than its predecessor.

e. Demonstrated in F-16 production a robotic work cell which forms advanced composite material and sheet metal aircraft parts and increases production 4 to 1 with a zero reject rate.

f. Developed and prepared for full scale flight test an aerodynamically advanced mission-adaptive wing which changes its shape to optimize performance during flight. Wind tunnel tests show range improvements of 50 percent at supersonic and 20 percent at subsonic speeds.

SELECTED MAJOR EFFORTS

The Air Force does not pursue technology developments for technology's sake, but to satisfy valid Air Force needs. I will now highlight some of our major efforts in terms of their concrete technological and operational payoffs.

A major goal of Air Force research and development is to improve aircraft performance. Our Advanced Fighter Technology Integration program consists of two ongoing demonstrations--Fighter Attack Technology and Mission Adaptive Wing--and a new program, the Advanced Survivable Fighter. Fighter Attack Technology integrates advanced aeronautical technologies, digital flight control, and improved pilot vehicle interface to enhance survivability and weapon delivery accuracy. The Mission Adaptive Wing integrates advanced structures and an automatic control system for a smooth skin, variable camber wing on a NF-111 testbed to extend range and expand the flight envelope. The Advanced Survivable Fighter will demonstrate the addition of propulsion control to integrated flight/weapons control, thrust vectoring and reversing, and other short takeoff and landing technologies to improve short field and soft surface operation.

Historically, United States turbine engine technology stressed improved performance. While continuing our core performance program, we have now shifted emphasis to improved durability. Our advanced engine development is concentrated in the Advanced Turbine Engine Gas Generator (ATEGG) and Aircraft Propulsion System Integration (APSI) programs. In ATEGG, we develop and assess engine core components under realistic operating conditions to ensure timely application to engine development programs. APSI complements ATEGG by developing and demonstrating complete propulsion subsystems. The investment in these programs will be felt in the mid-1980s when new compressors and turbines with substantially fewer stages and much greater mechanical simplicity will have been evaluated. Future engines will be smaller, more powerful, more efficient, and much more durable.

We are entering a new era of weapons technology, and the Air Force will remain in the forefront of DOD's efforts in high energy lasers. We are conducting initial Airborne Laser Laboratory demonstrations against missile and drone targets at short ranges. During 1982, we will upgrade the Airborne Laser Laboratory for operational tests against more stringent missile target scenarios and fabricate mirrors for the nation's first and most powerful high power cylindrical chemical laser. We will also begin the first crucial steps to provide the technology base for space-based high energy lasers.

Enemy defenses such as those found in the NATO central region often make attack at altitudes above 300 feet altitude impractical. At these low altitudes, reaction time is limited because the interval between target detection and munition launch is extremely short, and it may not be possible to maneuver directly over the target to release munitions. Therefore, future weapons must react fast, fly fast, and be able to strike offset targets. The new Hypervelocity Missile program will provide these capabilities by automatic launch of very fast, small, laser guided missiles in rapid sequence. As many as ten missiles will be simultaneously guided to different targets. The system will hit small mobile targets and will assure high aircraft survival.

A related problem is that our present ability to penetrate advanced armor is limited because current warheads have insufficient kinetic energy and lack the required material properties. We are doing in-house work in self-forging fragment technologies to significantly enhance the kill capability of antiarmor submunitions. Our goal is to make depleted uranium penetrator technology available to industry for new warhead development. These warheads will have double the penetrating power of current weapons at reduced cost.

We must be able to get our aircraft and weapons to their targets under all environmental conditions. Towards this goal, we are starting a new program, Covert Survivable In-weather Reconnaissance/Strike. The program features use of advanced radar concepts to enhance survivability of aircraft penetrating heavily defended areas.

Integrated circuit technology is the keystone of modern avionics, yet our requirements continue to outpace current technology. The three services, with Air Force as lead, have joined forces in the Very High Speed Integrated Circuits (VHSIC) program to provide the technology for the next two generations of integrated circuits. We expect power, weight, and cost improvements by a factor of ten. With these "building blocks," we will build radar signal processors for automatic target cueing, automatic image processors for infrared and terminal weapons guidance systems, electronic warfare signal sorters for high signal density environments, and many other capability enhancing devices.

Increased computer speed and greater storage capacity are only part of the answer to improved avionics. Overall weapon system performance needs faster, more capable avionics to collect, analyze, and process information. Advanced System Integration Demonstration is a new program to demonstrate an integrated approach to interconnection and control of navigation, communications, defensive, and offensive subsystems. The fusion of these subsystems will radically improve aircraft survivability and combat effectiveness, while increasing system flexibility, reliability, and supportability.

The services, NASA, and the Department of Energy have mounted a coordinated long-term effort to ensure that liquid fuels obtained from domestic resources such as oil shale, tar sands, and coal will be acceptable in high performance engines. The Air Force Aviation Turbine Fuel Technology program will determine the effects of broader specification fuels and shale derived fuels. Results to date provide encouraging evidence that the Air Force can use fuel produced from the vast U.S. resources of shale oil.

The Air Force thrust in Rapid Solidification Technology is aimed at improving material performance and reducing our dependence on foreign sources of critical materials. We will also augment our already substantial work in powder metallurgy. We believe this new materials technology can produce alloys impossible by other methods and enhance desirable properties such as high strength, low weight, and corrosion resistance. In the near term, we will concentrate on aluminum and expect to better existing alloys by up to 30% in weight and to greatly extend their high temperature limits. Longer term work will focus on titanium and nickel-based super alloys. This means we can substantially reduce aircraft structural weight and improve aircraft structural durability. It also means we may be able to substitute lower-cost aluminum in some applications where titanium is now required.

We know that the first five or six combat missions are crucial to inexperienced pilots in combat; their losses are high during this period. We can use simulators to develop at least some of the skills required for actual combat. A key to this type of training capability is highly realistic visual effects simulation. Current visual systems cannot provide the realism required. In our simulator work, we are taking several approaches to this problem. One of these is advanced computer image generation systems which will produce realistic, detailed images of geographic areas, moving threats, targets, and friendly forces. Other approaches focus on improved display schemes. If successful, these efforts simulator will allow pilots the opportunity to train realistically against threats and targets comparable to those found in combat.

In the past year, the DOD and the services have emphasized the deficiencies in our chemical warfare capability. In response, the Air Force, in coordination with the Army, has accelerated exploratory development and will initiate a new advanced development program in Chemical Warfare Defense for fiscal year 1982. These efforts will address Air Force unique problems in personal protective equipment, medical operations and equipment, airbase operations, and aircrew performance. Focus will be on effectiveness, ease of use, and interoperability with our NATO partners.

TECHNOLOGY BASE FUNCTIONAL AREAS

Technology Base functional areas--Propulsion, Materials, Flight Vehicles, Electronics, Weaponry, Environment, and People--provide a convenient breakout for discussing the efforts contained in the Technology Base. A list of Technology Base programs is contained in Table VI at the end of this statement. In the following sections, I will cover each functional area and conclude with a synopsis of the major thrusts of our Research program.

Propulsion. I have already described the reliability and durability of our turbine engine programs and our testing of the effects of shale fuels. In addition, we will begin to test with the Navy an engine with variable cycle features. We will demonstrate the ability to vary geometry, engine airflow, thrust, drag, and fuel consumption to optimize performance over a wide range of flight conditions.

We will develop minimum smoke rocket propellants. Our work in thrust controllable solid fuel rocket motors will continue, leading to greatly increased end-game maneuverability. Our work in ducted rocket and solid fuel ramjets will be flight tested. We hope to demonstrate performance improvements of 35 to 100 percent in range and a 50 percent reduction in time-to-target over current propulsion systems.

Materials. Our Materials programs are driven by our need for lighter, stronger, cheaper, more durable materials and by the increasing uncertainty of supply for many strategic materials.

Our structural materials research and development program is among our strongest. We have developed fiber-reinforced composite materials, which reduce structural weight by 10 to 30 percent. In 1982, we will begin advanced development programs which will show that these materials are suitable for the primary structure of large combat aircraft and will extend their allowable operating temperature range to equal or exceed aluminum.

The powder metallurgy program that I mentioned earlier will begin in fiscal year 1982. We will continue our strong programs in carbon-carbon and metal-matrix composite materials, and our vigorous advanced development program in laser-hardened materials.

We will expand our efforts in electronic materials for sensors, devices, and radomes and will finish projects in fuel tank sealants and improved hydraulic system seals and fluids.

Flight Vehicles. The Air Force naturally has a strong interest in advancing flight related technology. We must provide advances to support totally new vehicles as well as technology which can be incrementally applied to the existing fleet.

We will continue our research and development in the application of advanced materials to aircraft structures. Our ongoing work in metal-matrix composites has given us a good understanding of the strength and stiffness of these revolutionary materials. Our program will now focus on understanding durability and damage tolerant properties of metal-matrix composites. Organic matrix composites are already being used in aircraft secondary structures and are beginning to be used in primary structures. We will continue to foster wider application of these materials and develop unique uses such as for radar absorbing structures.

Crew escape continues to be a pacing technology for manned aircraft. Present high technology ejection seat limits do not match the full operational envelope of all our first line aircraft. We are hard at work to improve the low altitude, high speed capabilities of our seats.

Air conditioning is vital to both crewmembers and electronic equipment. Present environmental control systems have unreasonably high costs in terms of overall vehicle efficiency. Moreover, operation at higher speeds, higher altitudes, and for longer durations will not be possible with today's environmental control systems. In 1982, we will start a closed-loop environmental control system which will substantially reduce power requirements and dramatically extend speed, altitude, and duration limits.

Our Advanced Fighter Technology Integration program mentioned earlier will demonstrate unconventional aircraft motion control. The capabilities we are demonstrating will add a new dimension to our combat tactics and weapon delivery accuracy.

We will continue our damage tolerance and battle damage repair programs with increased emphasis on fuel tank inerting systems and field repair of advanced composite structures.

Reducing the dependence of our forces on long, hard, smooth runways will retain its high priority. For the near term, we will continue our work on reducing aircraft landing gear footprint pressure and on developing landing gear systems able to operate on rough and soft surfaces. For the longer term, we are generating the aerodynamic and propulsion data needed to develop short takeoff and landing aircraft. The Advanced Survivable Fighter mentioned earlier will demonstrate these technologies.

In fiscal year 1980, we began an effort to apply advanced technology to fix or replace high-cost-to-repair aircraft structures. Our initial study has identified several high maintenance cost items, and we are applying technology to build better, cheaper, and more durable replacements. We will expand our efforts in this area in 1982.

Electronics. The modern battlefield is in large measure an electronic battlefield. In light of the increasing Soviet threat, we must develop new capabilities to avoid detection, overcome defenses, and improve battlefield survivability. During fiscal year 1982, we will work on devices to counter terminal defense system radars which operate on millimeter wave (MMW) frequencies. This includes efforts to develop chaff effective against MMW radar.

We have begun an exploratory development effort to automatically identify and even distinguish target type using onboard electro-optical and radar sensors. In fiscal year 1982, we will flight test an active forward looking target classifier to demonstrate system feasibility.

Distributed or decentralized processing can reduce system vulnerability by removing the potential for single point failure. We will capitalize on advances in microprocessor hardware and computer networking by making distributed systems more reliable and survivable. A key objective is to develop a simulation capability to assess their value in a realistic tactical environment.

As we push for all-weather capability, radars must perform multiple functions: terrain following, terrain avoidance, ground mapping, ground target detection, and identification. In addition, current tube-type radar transmitters have a very poor reliability. Active aperture technology under development promises to eliminate these limitations. Small, solid-state modules combined in an array permit multifunction operation, replace the troublesome tube, and offer improvements in transmitter/receiver reliability, with reduced size and weight.

Command, Control, Communications, and Intelligence has assumed a central role in modern warfare. Recent successes in electronic technology offer enormously improved capabilities for this vital mission area. We are expediting the transition of these key technologies to advanced development programs.

Weaponry. We must develop more effective weapons--weapons in which maximum damage inflicting potential is integrated into a small, lightweight, affordable package.

I previously described the Hypervelocity Missile program, the complementary depleted uranium warhead development program, and the high energy laser program.

In other areas, we will continue particle beam research on key questions regarding use of charged particle accelerators for potential weapon applications. Our technology development efforts are cooperatively funded with the Department of Energy/Sandia National Laboratories and are coordinated closely with the Department of Defense Particle Beam Technology program. Underlying these development efforts is an active basic research program in directed energy. Laser research will address the physics of lasing media and development of free electron laser. Research on particle beams will explore beam generation, acceleration, and pointing and tracking for charged particle and neutral beams.

Environment. Our programs in the Environment functional area have changed considerably since I reported to you last year. This shift in emphasis reflects both the success of our previous programs and the changes that we foresee in our operational needs.

The SCATHA spacecraft charging experiment, being completed this fiscal year, has given us an excellent understanding of the causes and cures for spacecraft charging phenomena.

We have begun work to reduce the time our runways could be unusable after an attack. Our overall goal is to be able to launch mission aircraft within one hour after attack using alternate surfaces or other means and to repair the airfield to permit sustained operation within three or four hours. We have begun a new basic research program to investigate radically new approaches to this problem.

Battlefield weather is a long-standing military problem which has taken on new importance with Air Force commitment to precision guided munitions, since weather can greatly affect such weapons. Accordingly, we have begun to develop methods to gather appropriate meteorological data to allow optimum weapon/mission/weather matching.

People. People remain at the top of our priority list. The importance of this resource continues to grow while the potential supply shrinks demographically and the technology content of our defense systems grows. We foresee no relief from our present difficulty in obtaining people in the numbers and of the capability we require. Consequently, we will continue to focus our Technology Base People programs on improving management, performance, and productivity.

We will continue our efforts to maximize the productivity of our logistics work force and to streamline and modernize the logistics function. We have begun to develop ways to obtain quick, accurate predictions of how a given logistics system will respond to changes in material supply, equipment, and manpower, taking into account the stress of a wartime surge environment.

We now use simulators not only for training, but also to measure performance improvements which result from that training and to find innovative ways to obtain improved performance from existing and planned systems. As the complexity of our aircraft systems and their missions increases, we find that the crew's performance can be seriously degraded by work overload. In 1982, we will begin an aircrew performance enhancement program which will find optimum ways to improve crew performance.

The programs I have described are directly people related. These programs require a solid foundation in biotechnology. Our biotechnology work focuses on protection against environmental hazards inherent in the Air Force mission: g-forces, temperature extremes, low pressures, chemical weapons, industrial pollutants, and cardiovascular stress. Our Health Evaluation and Risk Tabulation (HEART) package will be completed this fiscal year, ready for a decision on Air Force-wide implementation. Study of the toxicology of synthetic fuels will be a major effort in fiscal year 1982. A new major thrust will focus on protecting aircrew members from chemical agents while minimizing performance degradation and stress.

Research. Basic research is the firm foundation of future military systems. The Air Force Research program stimulates science and advances technology so we can maintain our technological advantage and avoid surprise.

The Air Force Office of Scientific Research manages our Research program and provides a major link with the civilian research community. By careful selection of the research we sponsor, we greatly expand the number of scientists aware of, and interested in, Air Force problems; we expand the base of expertise accessible to us; and we generate new and innovative--potentially breakthrough--ideas and concepts.

Our efforts in basic research for fiscal year 1982 include the expansion of our fiscal year 1981 initiatives in the science base for directed energy weapons and blast resistant structures.

Strategic missile system silo and crew protective structures requirements motivate our blast resistant structures research. We will investigate how soil and rock behave when subjected to very intense shock loads and how buried structures interact within the earth under blast and large ground motion.

In 1982, we will begin major new research initiatives in vehicle energy efficiency, low speed aerodynamic phenomena, "smart" weapon systems, manufacturing sciences, and chemical defense.

Aerodynamic vehicle efficiency research will focus on friction and form drag aerodynamics, and lift and thrust enhancement due to large amplitude unsteady wing motion. The potential for active control methods to reduce drag and enhance efficiency will also be explored.

The low speed aerodynamics thrust is directed toward understanding complex aerodynamic phenomena important to vertical/short takeoff and landing vehicles.

Weapon systems research will consider control system dynamics, decision and control theory, and artificial intelligence concepts applicable to long standoff weapons, remotely piloted vehicles, and unmanned space systems. In all these systems, post-launch human intervention will be minimal.

Manufacturing sciences work will concentrate on technology associated with the near-completion, high-value/high-investment stages of manufacturing processes. Areas of emphasis are optical recognition, metrology, computer vision, robotics, and nondestructive evaluation.

Our chemical defense motivated research thrust will support work on the properties of chemical agents, detection systems, environmental transport mechanisms, protective methods, and the related aspects of physiology and organic chemistry.

TECHNOLOGY BASE SUMMARY

Previous investment in the Technology Base has paid off in superior systems, components, and techniques now operational, such as fly-by-wire control systems, forward looking infrared scanners, synthetic aperture radar, and precision guided weapons. The relevant technologies which support these advances arose from fundamental research supported by the Air Force in the past. During early development, the specific applications we now realize were not known, but the spectrum of possibilities was great enough, and the foresight of our predecessors sharp enough to carry forward the work. Many equivalent opportunities for the 1980s and 1990s exist and have been described in this statement.

Of course, the realization of these opportunities requires continued investment. In spite of determined efforts to strengthen the Technlogy Base investment, we have seen little real growth. Inflation is the primary cause for the lack of adequate growth. The cost of a contracted man-year of engineering effort rose 36 percent from 1978 to 1980, a rise far greater than the general inflation rate. As a result of these and similar increases for equipment, the number of man-years of scientific and engineering effort we can afford to buy has fallen dramatically in spite of increasing budgets.

In contrast, the Soviet research and development investment has grown enormously, and their investment has already yielded dividends. They have reduced our lead in many militarily significant technologies and have outpaced us in other potentially high payoff areas.

Our need to maintain technological superiority is not, of course, limited to only those areas where we confront known adversaries. In terms of maintaining a healthy manufacturing base, we are subject to severe competition even from our allies. A well known example of this is the electronic industry, with Japan the competitor. As recent history has so convincingly shown, the markets, the manufacturing facilities, the jobs, and the economic health go where the technology is.

The fiscal year 1982 Technology Base budget request is the Air Force's response to these critical challenges to our future. It provides for a lean, focused, fine-tuned foundation program essential to national technological health in defense science and technology and includes some real growth to allow timely exploitation of operationally promising technologies. We look for your continued support for this crucial investment in our future security.

VII. MANAGEMENT, SUPPORT, AND DEFENSE-WIDE SYSTEMS

The remaining programs, which support and increase the effectiveness of our military forces, fall into three categories: Management, Support, and Defense-Wide Systems. A complete listing of the programs is shown in Table VII at the end of this statement.

MANAGEMENT

Management includes programs which pay for the people employed by Air Force Systems Command who actually develop and acquire future Air Force systems. These programs also pay for the activities which support those scientists, engineers, and managers, including rents, utilities, computer time, printing services, travel and transportation, contract services, supplies, and equipment. In addition, they cover base operating costs at Hanscom AFB, Massachusetts; Brooks AFB, Texas; and Los Angeles AFS, California. The fiscal year 1982 request will provide approximately the same level of support as in fiscal year 1981.

SUPPORT

Support contains those programs which fund the operation of Air Force test centers and the development of equipment used on Air

Force ranges for operational test and evaluation and training. We will continue to stress projects that improve our test capabilities, since much of our equipment and facilities date back to the 1950s. Newer, more accurate equipment not only improves the quality of testing we can provide, but also leads to greater productivity which holds down test costs.

Test and evaluation (T&E) is a critical step in the system acquisition process. Well planned testing can head-off problems before they show up as deficiencies in fielded systems. The Test and Evaluation Support program funds base maintenance and support functions at Eglin AFB, Florida; Arnold AFS, Tennessee; and Edwards AFB, California; as well as the test and evaluation costs at the Armament Division, Eglin AFB, Florida; Arnold Engineering Development Center, Arnold AFS, Tennessee; Air Force Flight Test Center, Edwards AFB, California; and the 4950th Test Wing, Wright-Patterson AFB, Ohio. Testing at these facilities is not limited to Air Force programs; they are used by the other services and government agencies as well.

As previously mentioned, an inexperienced aircrew's chance of survival in combat increases dramatically after the first few missions. Therefore, we are trying to increase the probability of survival by simulating those early missions in a realistic training environment. We also need a realistic environment for effective operational test and evaluation of weapon systems. These objectives are being accomplished in the Improved Capability for Operational Test and Evaluation program. The program includes development of threat systems to simulate the combat arena and instrumentation to provide aircrew feedback on mission performance and collect data for operational test and evaluation.

DEFENSE-WIDE SYSTEMS

Defense-Wide Systems includes programs which support more than one defense mission. Some of the major programs include Modular Automatic Test Equipment (MATE), Next Generation Trainer (NGT), Engine Model Derivative Program (EMDP), and Aircraft Engine Component Improvement Program (CIP).

In the MATE program we are trying to overcome current automatic test equipment (ATE) acquisition practices which have resulted in a proliferation of equipments, inadequate ATE operational reliability and supportability, and excessive life-cycle costs. Aircraft availability or force readiness has suffered because of malfunctioning test equipment at all levels of maintenance. Management efforts to force the use of common ATE across weapon systems have not succeeded because of the lack of necessary specifications, standards, guidebooks, and other development, acquisition, and management tools. The MATE program addresses these problems and will provide effective ATE at the lowest possible life cycle cost through the use of a standardized acquisition management process and modular ATE hardware and software.

NGT addresses the need to replace or modify the T-37 aircraft in order to maintain our capability to conduct the primary phase of Undergraduate Pilot Training. Forecast increases in pilot production requirements in the mid-1980s, and the fact that the T-37, designed in the early 1950s, will begin to reach the end of its service life in 1986, dictate acquisition of a new trainer. The NGT program will be low risk in terms of technology and schedule, and will be relatively low cost. Candidates include a modernized T-37 aircraft, new aircraft designs, a derivative of an existing prototype trainer, and the Navy's T-34C trainer.

The Engine Model Derivative Program provides a mechanism to incorporate advanced technology into current inventory engines to achieve significant improvements in durability, reliability, and/or performance. In the past when the Air Force needed a derivative engine, it had to proceed directly into a full scale development program. The EMDP represents a more timely, less risky approach to meeting near-term propulsion system needs.

The Aircraft Engine Component Improvement Program (CIP) demonstrates solutions to service revealed difficulties and cost of ownership problems. Experience shows that it is impossible to identify or solve all engineering problems during the engine qualification process. Furthermore, some problems only emerge after years of operational service. For these reasons and the fact that past CIP efforts have demonstrated large cost avoidance payoffs, the CIP is a critical part of the engine acquisition and management process. Therefore, we will continue with an aggressive CIP to enhance Air Force operational readiness, maintain required performance, and ensure acceptable cost of ownership.

VIII. AIR FORCE PROGRAM MANAGEMENT

The Air Force is continually striving to improve the methods we employ to manage our programs. · Our quest for greater efficiency is driven by the rapidly growing capabilities of the Soviet military forces, the erosion taking place in the purchasing power of our defense dollars, and the deteriorating capability of our defense industrial base.

The Air Force has undertaken several management initiatives in technology planning and acquisition management. These initiatives are not limited to RDT&E programs solely. Rather, they include those which apply to the full spectrum of system acquisition, including procurement.

TECHNOLOGY PLANNING

The Air Force is constantly striving to improve the efficiency of its technology and development programs. To accomplish this, we are continuing the Vanguard planning system, as well as working with our NATO allies to get the most out of the dollars we spend.

Vanguard System. The Vanguard planning and control system is a continuing initiative to improve the efficiency of technology and development programs. Vanguard planners integrate threat information, scenario data, and mission area objectives to prepare a master plan for research and development needs and programs. Mission area planners then define and prioritize individual programs to satisfy this master plan. Implemented by the Air Force Systems Command, the Vanguard system provides a comprehensive roadmap of the planned contributions and interrelationships of all Air Force development and procurement programs. This information assists program managers in planning technological efforts and communicating their needs to all levels of command, as well as assisting the Air Force in preparing responsive research and development programs to satisfy our mission goals.

NATO. The Air Force and other members of the Department of Defense are continuing a number of initiatives to increase defense equipment standardization and interoperability within NATO. These initiatives include the family of weapons concept, establishment of dual production capabilities, and development of reciprocal purchasing memoranda of understanding. Our objectives are to increase combat effectiveness, strengthen the overall military and industrial capability of the Alliance, reduce unnecessary duplication of programs, and to conserve our vital defense resources.

Through the family of weapons concept, Alliance requirements are harmonized for discreet mission areas. When complementary systems are found to be compatible from both a requirements and timing standpoint, shared development programs may be undertaken. The recently signed memorandum of understanding for advanced air-to-air missile systems is the first use of this concept. The U.S. will develop and produce the Advanced Medium Range Air-to-Air Missile

(AMRAAM), and European participants (currently Germany and the United Kingdom) will jointly develop and produce the Advanced Short Range Air-to-Air Missile. Each side will be able to produce the other's missile. This joint project will save the U.S. the cost of developing the next generation short range air-to-air missile system.

The establishment of dual production capabilities for the same weapon system on both sides of the Atlantic is accomplished through license arrangements. This provides for standardization and savings of funds that would have otherwise been spent to develop similar systems. The ongoing coproduction of the F-16 multinational fighter is a classic example of the successful employment of this approach.

The third initiative involves the reciprocal purchasing memoranda of understanding for defense equipment. In support of this initiative, the Air Force has fostered understanding of our acquisition process through sponsored visits by foreign industries to our Systems and Logistics Commands. In addition, we have a European Workload Program with the objective of increasing our readiness in Europe by placing some maintenance and overhaul capability there.

To further enhance Alliance standardization, the Air Force budget includes funds to support our work with our allies on the NATO Airborne Warning and Control System, the purchase from the United Kingdom of the Rapier missile for point air defense of our air bases there and the reengining of the KC-135 with the U.S.-French developed CFM-56 engine.

ACQUISITION MANAGEMENT

The Air Force has a number of ongoing acquisition initiatives to ensure that the money provided by Congress is spent wisely. These initiatives are in the areas of acquisition policy, contracting actions, and program management.

Acquisition Policy. The overall Air Force policy governing major acquisition programs has been updated to reflect growing concerns for energy conservation and weapon system supportability. The need to promote energy conservation through acquisition decisions is reflected in Air Force regulations and instructions guiding the implementation of acquisition programs. Starting with the Statement of Need through all phases of the program, program managers and all echelons of review are required to consider energy efficiency in making acquisition decisions. The KC-135 Reengining program, B-52 Companion Trainer Aircraft program, and our aircraft simulator programs included in the Air Force budget support our concerns for reducing future energy needs.

Our acquisition policy has also been updated to reflect a new emphasis on weapon system supportability. In recognition of the significant portion of weapon system costs allocated for operation and maintenance, supportability considerations are now included early in the design process along with system performance, cost, and schedule requirements. Through the early consideration of supportability requirements, we expect to achieve greater visibility into weapon system life cycle costs and the impact of various design alternatives on those costs.

Contracting Actions. The Air Force has several ongoing contracting actions to deal with the eroding purchasing power of our defense dollars. These actions include refining contracting methods, emphasizing competition, requiring industry to take greater responsibility for the quality of their products during the operational phase, and integrating "buy commercial" policies into the acquisition process.

We are continuing to refine our contracting methods to do business more like our industrial counterparts. We will use, where appropriate, firm fixed priced contracts and fixed price incentive contracts with tightened share ratios. These contracting methods are generally used on mature production programs and some research and development level-of-effort studies and competitive prototype programs. In addition to the stabilizing force these methods have on defense contractors, they also provide incentives to contractors to increase profit through improved internal operations and sharing in more of the program risk with us.

The Air Force will continue its commitment to increase competition by reducing sole source contract awards. Through our acquistion policies and reviews by a Business Strategy Panel, competitive acquisition strategies are encouraged. Through competition, we are seeking more innovative solutions to our defense problems, higher quality products, and fair prices for those goods and services we buy. Generally, once a program reaches the production phase, a sole source production contract is let. However, on some programs where the production quantities are large, a second sourcing technique can be used to maintain competition during the production phase. Included in the Air Force budget are funds to develop a second source for the Imaging Infrared Maverick program.

An area of continuing contracting interest is in contractor responsibility for quality, reliability, maintainability, and availability after items are accepted and in Air Force use. As an example of Air Force activities in these areas, we are refining our procedures on the use of warranties. We have worked out guidelines with industry on the proper application of warranties and have begun applying warranties to many products. The fix without charge provisions of these warranties encourages contractors to design better products and correct deficiencies before systems enter operational use. Included in the Air Force budget are funds to provide warranties on the Air Launched Cruise Missile program and the TF34 and F100 engine programs.

The Air Force supports the policy of integrating "buy commercial" policies into its acquisition process. Aspects of this policy are reflected in the acquistion strategies and support concepts of the KC-10A Advanced Tanker Cargo Aircraft and the B-52 Companion Trainer Aircraft programs. The Air Force is also continuing its efforts to review available commercial items for direct acquisition without developing detailed military requirements for similar items. These efforts will assist us in striving to reduce our development and life cycle costs.

Program Management. The Air Force is actively pursuing, with other Department of Defense agencies and defense contractors, management alternatives for dealing with the economic factors that are adversely affecting our acquisition process. Our efforts are directed at reducing unit cost through economical quantity buys, encouraging capital investment in more modern and efficient machines and tools, and increasing productivity.

The Air Force is supporting initiatives to reduce weapon system unit costs through more economical acquisition practices. Presently, procurement quantities are authorized and the funds appropriated by Congress on an annual basis. This leads to annual contracts which generally allow contractors to purchase only materials, parts, and production capacity for the quantity approved. In the economic environment of the 1970s, inflationary pressures have forced unit prices up. To stem this trend, we support using, on appropriate programs, multiyear procurements and an incremental funding approach.

Multiyear contracts are currently an approved technique. They involve a more definitive commitment by the Government to longer term programs by offering contractors protection against losses from unrecovered nonrecurring costs. However, P.L. 93-155, Section 810, prohibits a cancellation ceiling in excess of 5 million dollars without separate advance statutory approval. As a practical matter, the time required to obtain such a statute renders multiyear contracting impractical for many major systems acquisitions. We support initiatives to eliminate the cancellation ceiling or, as a less preferred alternative, to substantially increase the cancellation ceiling limitation. The Air Force is currently evaluating the use of a multiyear contracting strategy for several programs, including the KC-10, F-16, Air Launched Cruise Missile, and Global Positioning System satellites.

We are also working with the Office of the Secretary of Defense (OSD) to find ways to permit contractors to purchase outyear quantities of materials and components when doing so will yield significant savings. Two methods of funding to achieve economies of scale are under consideration. The first would permit, as an exception to the DOD full funding policy, the advance procurement of materials for outyear requirements for reasons of economic savings. Currently, advance procurement is permitted only for long lead items and not for economic reasons. The second and preferred method would allow contractors to purchase economic lots of materials and components for outyear requirements and include those recurring costs in the cancellation ceiling. Currently, only nonrecurring costs (that is, start-up costs) may be included. We will continue to work with OSD and the Congress to process the necessary changes to the statutes and DOD directives.

Incremental funding is another approach to reduce unit costs through authorizing economical quantities at the start of the program. This approach is specifically being requested for use on the Defense Support Program (DSP) satellite production and being considered for TR-1 aircraft production programs. It requires authorizing the firm quantity of production DSP satellites and TR-1 aircraft at the start of the programs and incrementally funding the programs (rather than fully funding complete end items in a series of separate annual buys). We anticipate that significant savings will result if this approach is approved.

The Air Force is continuing to seek ways to encourage defense contractors to invest in modern production facilities and equipment. For many years, the U.S. has invested heavily in technological innovation, new manufacturing processes, and increased productivity. The benefits of our investments, however, have not been equally applied within the defense industry. Many of our defense industries are still using facilities and equipment over 20 years old. This situation has been developing over many years from the influences of tough economic conditions, inflationary erosion of profits, and existing laws and regulations covering taxes and depreciation. Our initiatives to use multiyear contracts on major weapon system acquisitions, to provide termination protection for certain contractor investments in capital equipment, and to negotiate higher contract profits, where appropriate, will assist greatly in resolving some of the disincentives our defense contractors face in investing in new facilities and equipment.

We are also striving to refine our policies and procedures which adversely impact contractors' profits. Inflation and high interest rates have discouraged or prevented contractors from borrowing funds. On DOD contracts, interest expenses are not an allowable cost. We have been working with defense contractors to understand the impact our policies and procedures are having on their profits. Our initiatives to date centers on the contractors' need for cash for contract performance. Early payment for work performed assists in reducing the erosion of contractors' profits due to the high cost of money. In those cases where a contractor documents needs for earlier compensation for incurred costs, we consider and use milestone billings to reduce the contractor's need to borrow money for contract performance.

The Air Force supports the ongoing Congressional actions being taken to revamp current national laws which adversely impact capital investment. The revamped Capital Cost Recovery Act of 1979 will be a positive step forward in encouraging capital investment by divorcing capital recovery from the useful or physical life concepts and by providing depreciation alternatives which allow faster capital recovery.

Productivity is a measure of the overall health of our defense contractors, and it impacts their ability to respond to our continuing and wartime surge requirements. Over the past several years, the productivity has declined along with investments for research and development, industrial facilities, and equipment. Other factors which affect productivity are manufacturing technology and availability of critical materials.

The Air Force initiatives discussed under economical quantity buys and capital investments will help reverse the trend of declining productivity in our defense industries by encouraging investment in new facilities and equipment. The Air Force Industrial Facilities Program will continue to augment defense industry contractors' capabilities, where necessary. Included in the Air Force budget are production funds to maintain the facilities and equipment included in the Industrial Facilities Program.

The Manufacturing Technology (MANTECH) program has successfully demonstrated an ability to improve industrial productivity, reduce dependency on critical materials and foreign sources, provide new manufacturing capability, and reduce hardware costs. Through the MANTECH program, we encourage the use of new technologies and techniques to improve the productivity and responsiveness of our defense industries. Included in the Air Force budget are MANTECH production funds to develop manufacturing technology for both general and specific use on Air Force programs, modernize Air Force Air Logistics Centers, increase the use of computer aided manufacturing technology, and accelerate advance manufacturing technology applications.

The Air Force is working with other DOD agencies and defense contractors to reduce our growing dependence on foreign sources of raw materials and fuels used in the production of defense systems. As we apply advanced technologies to our new weapon systems, the list of materials and fuels required to produce these systems expands. Materials such as columbium, titanium, beryllium, manganese, tantalum, chromium, nickel, tungsten, and aluminum are being widely applied in system designs to gain additional performance and withstand higher operating temperatures. Many of these metals are only available from foreign sources.

We have several initiatives to reduce our dependence on critical materials and fuels. Our Rapid Solidification Technology program will help us reduce critical materials required to produce high technology components. Our Materials Research program is searching for alternate solutions which do not require or will reduce the need for critical materials. In addition, our Aviation Turbine Fuel Technology program is evaluating the impact on Air Force systems of shale oil fuels, sources of which are readily available within the U.S.

IX. CONCLUSION

As a nation, we face a grave threat today--a threat that has been heightened in part because of our unilateral self-restraint and our hopes for peace and security based upon reaching agreement on arms control. However, the Soviets have not chosen to match our restraint. On the contrary, they have modernized and expanded their military capability at such an awesome pace that it leads one to seriously doubt that mere parity is their goal. Indeed, their momentum, if unchecked and unmatched, will certainly lead to superiority.

But the Soviets have underestimated our resolve. As we cherish our freedom and that of our friends, we cannot afford to be second to the Soviets. To counter their threat, we have taken great care in structuring the Air Force's RDT&E program so that it fully supports, in conjunction with the other elements of the defense program, our national security objectives. Since the RDT&E program represents future capability, it is imperative that it be carried out fully and completely--not just fiscal year 1982, but for years to come. In this respect, our program not only addresses the threat; it also has been prudently scoped to be economically feasible and politically supportable over the long run. To conserve our precious resources, we are taking into consideration the contributions of our allies; we are joining with our sister services and other government agencies in those development efforts which make sense; and we are emphasizing efficiency, better management, and innovative, cost-effective approaches in the selection and development of weapon systems.

I strongly urge your support in implementing the RDT&E program I have discussed.

TABLE I
DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 RDT&E BUDGET ESTIMATES
(IN MILLIONS OF THEN YEAR DOLLARS)

RDT&E PROGRAM BY MAJOR MISSION AREAS

TITLE	FY 82
STRATEGIC	3689.8
GENERAL PURPOSE	1357.9
SPACE	506.6
COMMAND, CONTROL, AND COMMUNICATIONS	720.5
TECHNOLOGY BASE	990.9
MGMT, SUPPORT, & DEFENSE-WIDE SYSTEMS	1062.3
INTELLIGENCE & CLASSIFIED PROGRAMS	1070.1
TOTAL	9398.1

TABLE II
DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 BUDGET ESTIMATES
(IN MILLIONS OF THEN YEAR DOLLARS)

STRATEGIC

PE #	TITLE	FY 82
	STRATEGIC OFFENSE	
11213F	MINUTEMAN SQUADRONS	33.0
63311F	ADVANCED STRATEGIC MISSILE SYSTEMS	49.0
64312F	M-X	2423.2
11113F	B-52 SQUADRONS	141.1
11142F	KC-135 SQUADRONS	31.9
63318F	COUNTER SOVIET UNION AWACS TECHNOLOGY	10.4
63319F	ADVANCED CRUISE MISSILE TECHNOLOGY (ACMT)	30.1
64226F	LONG RANGE COMBAT AIRCRAFT (LRCA)	302.0
64361F	AIR LAUNCHED CRUISE MISSILE (ALCM)	69.0
64738F	PROTECTIVE SYSTEMS	108.9
64758F	B-52 COMPANION TRAINER AIRCRAFT (CTA)	21.1
	SUBTOTAL	3219.7
	STRATEGIC DEFENSE	
12325F	JOINT SURVEILLANCE SYSTEM	1.3
12411F	SURVEILLANCE RADAR STATIONS/SITES	4.3
12417F	CONUS OVER-THE-HORIZON RADAR SYSTEM	21.3
63703F	CONUS OVER-THE-HORIZON RADAR SYSTEM	4.3
12423F	BALLISTIC MSL EARLY WARNING SYSTEM (BMEWS)	12.8
63424F	MISSILE SURVEILLANCE TECHNOLOGY	13.9
63425F	ADVANCED WARNING SYSTEM	12.4
12424F	SPACETRACK	8.0
12450F	SPACE DEFENSE OPERATIONS	1.1
63428F	SPACE SURVEILLANCE TECHNOLOGY	28.8
63438F	SATELLITE SYSTEMS SURVIVABILITY	11.1
64406F	SPACE DEFENSE SYSTEM	180.9
12311F	NORAD COMBAT OPERATIONS CENTER (COC)	23.6
12431F	DEFENSE SUPPORT PROGRAM (DSP)	146.3
	SUBTOTAL	470.1
	TOTAL	3689.8

TABLE III
DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 RDT&E BUDGET ESTIMATES
(IN MILLIONS OF THEN YEAR DOLLARS)

GENERAL PURPOSE

PE #	TITLE	FY 82
	AIR-TO-SURFACE ATTACK	
27129F	F-111 SQUADRONS	2.7
27131F	A-10 SQUADRONS	14.0
27133F	F-16 SQUADRONS	42.2
63230F	ADVANCED TACTICAL FIGHTER (ATF)	10.1
63242F	COMBAT AIRCRAFT PROTOTYPE (CAP)	22.1
63249F	NIGHT ATTACK PROGRAM	3.1
63609F	ADVANCED ATTACK WEAPONS	55.4
63747F	PAVE MOVER	5.2
64201F	AIRCRAFT AVIONICS EQUIPMENT DEVELOPMENT	13.1
64249F	NIGHT/PRECISION ATTACK PROGRAM	87.6
64362F	GROUND LAUNCHED CRUISE MISSILE (GLCM)	80.4
64601F	CHEMICAL/BIOLOGICAL DEFENSE EQUIPMENT	8.8
64602F	ARMAMENT/ORDNANCE DEVELOPMENT	25.3
64607F	WIDE AREA ANTIARMOR MUNITIONS (WAAM)	21.8
64608F	CLOSE AIR SUPPORT WEAPON SYSTEM (CASWS)	14.6
64612F	LOW LEVEL LASER GUIDED BOMB (LLLGB)	8.3
64614F	MEDIUM RANGE AIR-TO-SURFACE MISSILE (MRASM)	49.1
64616F	AIR LAUNCHED ASSAULT BREAKER	24.1
64733F	SURFACE DEFENSE SUPPRESSION	9.6
	SUBTOTAL	497.5
	COUNTERAIR	
27130F	F-15 SQUADRONS	57.1
28008F	AMRAAM OPERATIONAL UTILITY EVALUATION	3.1
63313F	ADVANCED MISSILE SUBSYSTEMS DEMONSTRATION	5.9
63370F	ADVANCED MEDIUM RANGE AIR-TO-AIR MSL (AMRAAM)	1.3
63742F	AIR-TO-AIR IDENTIFICATION	14.8
64314F	AMRAAM ENGINEERING DEVELOPMENT	138.6
64604F	LOW ALTITUDE AIRFIELD ATTACK SYSTEM (LAAAS)	60.0
64725F	AIRCRAFT IDENTIFICATION SYSTEMS	12.2
	SUBTOTAL	293.0
	DEFENSE SUPPRESSION	
27128F	F-4 SQUADRONS	6.3
27162F	TACTICAL AIR-TO-GROUND MISSILES	4.3
63739F	ADVANCE DRONE/REMOTELY PILOTED VEHICLE DEV	2.8
64220F	EF-111A	14.2
64724F	TACTICAL C^3 COUNTERMEASURES	12.1
64737F	AIRBORNE SELF-PROTECTION JAMMER (ASPJ)	54.3
64739F	TACTICAL PROTECTIVE SYSTEMS	23.8
64742F	PRECISION LOCATION STRIKE SYSTEM (PLSS)	81.2
64746F	EXPENDABLE DRONES	8.5
	SUBTOTAL	207.5
	RECONNAISSANCE	
27247F	TACTICAL SURVELLANCE SYSTEMS	.3
27431F	TACTICAL AIR INTELLIGENCE SYSTEM ACTIVITIES	9.1
63239F	ADVANCED TACTICAL AIR RECONNAISANCE SYSTEM	3.0

TABLE III (Cont'd)

PE #	TITLE	FY 82
64321F	TACTICAL FUSION CENTERS	9.8
64710F	RECONNAISSANCE EQUIPMENT	13.0
64750F	INTELLIGENCE EQUIPMENT	14.8
64751F	INTRA-THEATER IMAGERY TRANSMISSION SYSTEM	.5
64756F	SIDE LOOKING AIRBORNE RADAR (SLAR)	29.2
	SUBTOTAL	79.7
	MOBILITY	
41119F	C-5A AIRLIFT SQUADRONS	15.6
64231F	C-X PROGRAM	245.7
64753F	COMBAT HELICOPTER MODERNIZATION (H-X)	18.9
	SUBTOTAL	280.2
	TOTAL	1357.9

TABLE IV
DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 RDT&E BUDGET ESTIMATES
(IN MILLIONS OF THEN YEAR DOLLARS)

SPACE

PE #	TITLE	FY 82
35119F	SPACE BOOSTERS	19.3
35171F	SPACE LAUNCH SUPPORT	39.7
64411F	SPACE SHUTTLE	266.0
35110F	SATELLITE CONTROL FACILITY (SCF)	67.9
35130F	CONSOLIDATED SPACE OPERATIONS CENTER (CSOC)	19.5
35160F	DEFENSE METEOROLOGICAL SATELLITE PROGRAM	47.4
63402F	SPACE TEST PROGRAM (STP)	46.8
	TOTAL	506.6

TABLE V
DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 RDT&E BUDGET ESTIMATES
(IN MILLIONS OF THEN YEAR DOLLARS)

COMMAND, CONTROL AND COMMUNICATIONS

PE #	TITLE	FY 82
11312F	POST ATTACK COMMAND AND CONTROL SYSTEM (E-4)	9.4
11316F	SAC COMMUNICATIONS	29.5
12310F	WWMCCS ADP - NORAD/ADCOM	2.4
33131F	MINIMUM ESSENTIAL EMERGENCY COMM NETWORK	45.6
33601F	AIR FORCE SATELLITE COMM (AFSATCOM) SYSTEM	50.1
35158F	SATELLITE DATA SYSTEM	28.5
63735F	WWMCCS ARCHITECTURE	9.0
27411F	OVERSEAS AIR WEAPON CONTROL SYSTEM	2.3
27412F	TACTICAL AIR CONTROL SYSTEM	1.2
27417F	TACTICAL AIRBORNE COMMAND/CONTROL SYS (E-3A)	52.6
27423F	ADVANCED COMMUNICATIONS SYSTEMS	50.6
28010F	JOINT TACTICAL COMM PROGRAM (TRI-TAC)	28.5
63789F	C^3 ADVANCED DEVELOPMENT	10.2
64754F	JOINT TACTICAL INFORMATION DISTRIBUTION SYS	85.6
64779F	JINTACCS	7.5
33110F	DEFENSE SATELLITE COMMUNICATIONS SYSTEM (DSCS)	40.3
33126F	LONG HAUL COMMUNICATIONS (DCS)	8.0
33144F	ELECTROMAGNETIC COMPATIBILITY ANALYSIS CENTER	6.9
33401F	COMMUNICATIONS SECURITY	1.6
35114F	TRAFFIC CONTROL/APPROACH/LANDING SYSTEM	5.3
63431F	ADVANCED SPACE COMMUNICATIONS	66.4
63727F	ADVANCED COMMUNICATIONS TECHNOLOGY	5.3
64740F	APPLICATION FOR INFORMATION PROCESSING TECH	5.9
64778F	NAVSTAR GLOBAL POSITIONING SYSTEM (GPS)	166.1
65708F	AIRCRAFT NAVIGATION SYSTEM VERIFICATION	1.7
	TOTAL	720.5

TABLE VI
DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 RDT&E BUDGET ESTIMATES
(IN MILLIONS OF THEN YEAR DOLLARS)

TECHNOLOGY BASE

PE #	TITLE	FY 82
61101F	IN-HOUSE LAB INDEPENDENT RESEARCH	11.3
61102F	DEFENSE RESEARCH SCIENCES	139.5
62101F	GEOPHYSICS	34.6
62102F	MATERIALS	43.3
62201F	AEROSPACE FLIGHT DYNAMICS	55.3
62202F	AEROSPACE BIOTECHNOLOGY	40.1
62203F	AEROSPACE PROPULSION	54.1
62204F	AEROSPACE AVIONICS	63.7
62205F	TRAINING AND SIMULATION TECHNOLOGY	16.0
62302F	ROCKET PROPULSION	34.2
62601F	ADVANCED WEAPONS	40.3
62602F	CONVENTIONAL MUNITIONS	32.8
62702F	COMMAND, CONTROL, AND COMMUNICATIONS	67.1
62703F	PERSONNEL UTILIZATION TECHNOLOGY	5.4
63202F	ACFT PROPULSION SUBSYSTEM INTEGRATION (APSI)	23.1
63203F	ADVANCED AVIONICS FOR AIRCRAFT	17.1
63205F	FLIGHT VEHICLE TECHNOLOGY	6.7
63208F	RECONNAISANCE SENSORS/PROCESSING TECHNOLOGY	4.1
63211F	AEROSPACE STRUCTURES AND MATERIALS	19.5
63215F	AVIATION TURBINE FUEL TECHNOLOGY	6.8
63216F	ADVANCED TURBINE ENGINE GAS GENERATOR (ATEGG)	33.4
63227F	ADVANCED SIMULATOR DEVELOPMENT	2.2
63245F	ADVANCED FIGHTER TECHNOLOGY INTEGRATION (AFTI)	11.9
63250F	LINCOLN LABORATORY	22.2
63253F	ADVANCE SYSTEM INTEGRATION DEMONSTRATION	6.8
63302F	ADVANCED MISSILE PROPULSION	7.2
63363F	HYPERVELOCITY MISSILE PROGRAM	8.1
63452F	VERY HIGH SPEED INTEGRATED CIRCUITS (VHSIC)	40.7
63601F	CONVENTIONAL WEAPONS TECHNOLOGY	23.3
63605F	ADVANCED RADIATION TECHNOLOGY	80.8
63718F	ELECTRONIC WARFARE TECHNOLOGY	11.8
63723F	CIVIL AND ENVIRONMENTAL ENGINEERING TECHNOLOGY	4.0
63728F	ADVANCED COMPUTER TECHNOLOGY	4.8
63743F	ELECTRO-OPTICAL WARFARE	10.3
63745F	CHEMICAL WARFARE DEFENSE	4.0
63750F	COUNTER COUNTERMEASURES ADVANCED DEVELOPMENT	1.9
63751F	INNOVATIONS IN EDUCATION AND TRAINING	2.5
	TOTAL	990.9

TABLE VII
DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 RDT&E BUDGET ESTIMATES
(IN MILLIONS OF THEN YEAR DOLLARS)

MANAGEMENT, SUPPORT, AND DEFENSE-WIDE SYSTEMS

PE #	TITLE	FY 82
	MANAGEMENT	
65304F	ACQUISITION AND COMMAND SUPPORT-TELECOMM	4.7
65806F	ACQUISITION AND COMMAND SUPPORT	259.4
65890F	INSTALLATION AUDIOVISUAL SUPPORT (R&D)	5.8
65898F	MANAGEMENT HEADQUARTERS (R&D)	22.9
	SUBTOTAL	292.8
	SUPPORT	
64735F	IMPROVED CAPABILITY FOR OT&E	22.7
64747F	ELECTROMAGNETIC RADIATION TEST FACILITIES	3.1
65807F	TEST AND EVALUATION SUPPORT	365.5
78019F	UTAH TEST AND TRAINING RANGE	11.8
	SUBTOTAL	403.1
	DEFENSE-WIDE SYSTEMS	
01004F	INTERNATIONAL MILITARY HEADQUARTERS & AGENCIES	2.6
63101F	DEVELOPMENT PLANNING	3.2
63226F	DOD COMMON PROGRAM LANGUAGE	7.0
63228F	NEXT GENERATION TRAINER (NGT)	14.7
63244F	AIRCRAFT NON-NUCLEAR SURVIVABILITY	1.6
63707F	WEATHER SYSTEMS	2.9
63714F	DOD PHYSICAL SECURITY EQUIPMENT-EXTERIOR	1.0
64211F	ADVANCED AERIAL TARGET DEVELOPMENT	12.3
64212F	AIRCRAFT EQUIPMENT DEVELOPMENT	2.2
64218F	ENGINE MODEL DERIVATIVE PROGRAM (EMDP)	25.1
64219F	INTEGRATED DIGITAL AVIONICS	2.1
64222F	NUCLEAR WEAPONS SUPPORT	1.7
64223F	F101 DERIVATIVE FIGHTER ENGINE (DFE)	35.0
64227F	FLIGHT SIMULATOR DEVELOPMENT	26.5
64247F	MODULAR AUTOMATIC TEST EQUIPMENT (MATE)	20.3
64268F	ACFT ENGINE COMPONENT IMPROVEMENT PGM (CIP)	128.3
64706F	LIFE SUPPORT SYSTEM	11.0
64707F	WEATHER SYSTEMS	3.8
64708F	OTHER OPERATIONAL EQUIPMENT	13.2
64711F	SYSTEMS SURVIVABILITY (NUCLEAR EFFECTS)	12.1
64715F	DOD PHYSICAL SECURITY EQUIPMENT-EXTERIOR	7.9
65101F	PROJECT AIR FORCE	13.8
65306F	ENVIRONMENTAL EPIDEMIOLOGY	3.9
65808F	ADVANCED SYSTEMS ENGINEERING/PLANNING	5.0
78026F	PRAM PROGRAM	9.2
	SUBTOTAL	366.4
	TOTAL	1062.3

GLOSSARY

ABRES	Advanced Ballistic Reentry Systems
ACFT	Aircraft
ACMT	Advanced Cruise Missile Technology
ADP	Automated Data Processing
AFB	Air Force Base
AFS	Air Force Station
AFSATCOM	Air Force Satellite Communications System
AFTI	Advanced Fighter Technology Integration
ALCM	Air Launched Cruise Missile
AMRAAM	Advanced Medium Range Air-to-Air Missile
APSI	Advanced Propulsion System Integration
ASARS	Advanced Synthetic Aperture Radar System
ASPJ	Airborne Self-Protection Jammer
ATE	Automatic Test Equipment
ATEGG	Advanced Turbine Engine Gas Generator
ATF	Advanced Tactical Fighter
AWACS	Airborne Warning and Control System
BMEWS	Ballistic Missile Early Warning System
C^3	Command, Control and Communications
CAP	Combat Aircraft Prototype
CASWS	Close Air Support Weapons System
CIP	Component Improvement Program
COC	Combat Operations Center
CONUS	Continental United States
CSOC	Consolidated Space Operations Center
CTA	Companion Trainer Aircraft
DCS	Defense Communications System
DFE	Derivative Fighter Engine
DOD	Department of Defense
DSCS	Defense Satellite Communications System
DSP	Defense Support Program
ECM	Electronic Countermeasures
EMDP	Engine Model Derivative Program
FLTSATCOM	Fleet Satellite Communications
GBU	Guided Bomb Unit
GLCM	Ground Launched Cruise Missile
GPS	Global Positioning System
HEART	Health Evaluation and Risk Tabulation
H-X	Helicopter X
ICBM	Intercontinental Ballistic Missile
JINTACCS	Joint Interoperability of Tactical Command and Control Systems
JTIDS	Joint Tactical Information Distribution System
LAAAS	Low Altitude Airfield Attack System
LANTIRN	Low Altitude Navigation and Targeting Infrared System for Night
LLLGB	Low Level Laser Guided Bomb
LRCA	Long Range Combat Aircraft
MANTECH	Manufacturing Technology
MATE	Modular Automatic Test Equipment
MMW	Millimeter Wave
MPS	Multiple Protective Shelters

MRASM	Medium Range Air-to-Surface Missile
MSL	Missile
M-X	Missile X
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NGT	Next Generation Trainer
NUDET	Nuclear Detonation
OAS	Offensive Avionics System
OSD	Office of the Secretary of Defense
PLSS	Precision Location Strike System
PRAM	Productivity, Reliability, Availability, Maintainability
R&D	Research and Development
RDT&E	Research, Development, Test,and Evaluation
SAC	Strategic Air Command
SCATHA	Spacecraft Charging at High Altitude
SCF	Satellite Control Facility
SDS	Satellite Data System
SHF	Super High Frequency
SLAR	Side Looking Airborne Radar
STP	Space Test Program
SUAWACS	Soviet Union Airborne Warning and Control System
SYS	System
TRI-TAC	Joint Tactical Communications Program
US	United States
VHSIC	Very High Speed Integrated Circuits
WAAM	Wide Area Antiarmor Munitions
WWMCCS	Worldwide Military Command and Control System

AIRCRAFT AND MISSILE PROCUREMENT

Mr Chairman and Members of the Committee:

I am pleased to appear before this committee to discuss the Air Force Aircraft and Missile Procurement budget request. Events of the past year have made defense issues a matter of foremost public concern. The Soviet invasion of Afghanistan with large numbers of forces has caused us to reexamine our program priorities, especially within the areas of conventional warfare, mobility, and force projection.

The Soviet objectives in invading Afghanistan are not clear, but what is clear is the criticality of the oil resources of the Persian Gulf region to the free world. Our nation, in cooperation with our allies, must do all it can to prevent Soviet dominance in this area. For the Air Force, this means we must not only have the modern military hardware to maintain or achieve a stable deterrence, but we must be able to deploy, logistically support, and sustain our forces in this remote area so distant from our sources of supply.

Over the past few years, planning for the employment of our tactical and mobility forces has focused primarily on an engagement in the NATO central Europe environment. This commitment to NATO has not decreased. However, with our increased concerns in the Persian Gulf area, it is clear that the demands on the Air Force, as well as the other Services, have expanded significantly.

Soviet military adventurism can be traced to their capability to field a modern, first rate force. While subject to some degree of error in estimation, the Soviets' level of spending in both RDT&E and military forces (investment and operating costs) has surpassed ours by approximately 532 billion dollars since 1970 (fiscal year 1982 dollars). In terms of procurement of equipment and construction of facilities alone, the estimated Soviet spending in 1980 exceeded comparable U.S. spending by 29 billion dollars or 76 percent (fiscal year 1982 dollars). Since 1970, their estimated dollar costs are 65 percent larger than our comparable outlays. Estimated defense expenditures are imperfect and imprecise indicators, at best, because of the differences between U.S. and Soviet military and economic systems. However, these estimates are useful for comparisons as well as for illustrating relative trends.

As a result of these significantly larger expenditures, the Soviets have and are continuing to outproduce the United States in almost every category of military equipment. The technological lead that we have been relying on to offset numerical advantages is diminishing because the Soviets are fielding systems of increasing quality and sophistication. In addition, the makeup of Soviet airpower now reflects an increasing offensive capability in their weapon systems. This can be viewed in terms of increased payload, and range performances of fighter aircraft, as well as improved avionics, armaments and electronic countermeasures.

One factor in maintaining our forces operational capabilities is the production efficiency and the industrial base which support our defense requirements. To keep control of costs and make effective use of the available resources, we are emphasizing programs to upgrade the efficiency of industrial facilities and we have undertaken some important new initiatives to strengthen the effectiveness of our management of programs. We must also continue effective armaments cooperation with our NATO and other allies to collectively maximize the return on our investment for defense. I will address some of these initiatives in greater detail later in my statement.

This budget does reflect increased emphasis in aircraft spares and repair parts to improve our operational readiness and sustainability. However, this has been balanced with important production considerations which directly impact the forces needed during a conflict. In addition, we must continue a strong RDT&E program which investigates advanced technology that will enable us to counter future threats and correct military deficiencies. I believe that this budget also balances both our near term and long term requirements and that it represents the minimum essential to support national security objectives.

In presenting the fiscal year 1982 request, my discussion centers on the major mission areas, program management initiatives, and readiness. For each mission area, I briefly describe the current and projected threat, our deficiencies in meeting that threat and then highlight the key programs to improve our capabilities.

Under readiness I discuss those programs that provide support and distribute their costs to several different mission areas. This includes our spares and repair parts, common ground equipment, war consumables, and simulator programs. These programs are not all that affect readiness, but they are key programs in the aircraft and missile procurement appropriations and warrant separate discussion.

Finally, included at the end of this statement are tables of the fiscal year 1982 Procurement Program, or P-1 document. Also included is a glossary of acronyms and abbreviations. Detailed information on the individual programs can be found in the Congressional data sheets and the justification of estimates provided to Congress. Intelligence programs will be discussed in separate hearings.

II. STRATEGIC

Our approach to strategic forces is dictated by the need to maintain a stable deterrence in light of the substantial and increasing Soviet threat. In the remainder of this chapter, I will discuss this threat and describe how we have chosen to respond.

STRATEGIC OFFENSE

The fundamental objective of our strategic nuclear forces is to deter nuclear attack or the threat of such attack on the United States, our allies, and others whose security is vital to our national interests. To achieve this objective, we have adopted the strategic Triad concept: a robust, well-balanced, well-hedged, and complementary set of forces that can withstand and respond to a wide range of threats and uncertainties. The Triad consists of submarine-launched ballistic missiles, landbased intercontinental ballistic missiles (ICBMs), and the bomber leg, which includes cruise missiles and supporting tankers. These forces must be capable of surviving a preemptive first strike with a credible counterstrike capability of such magnitude as to deny the Soviets a favorable strategic outcome. The Triad concept has two major benefits. First, it provides confidence that, while the Soviets may be able to develop the capability to destroy or neutralize one leg of the Triad at any given time, they would find the task of simultaneously neutralizing all three legs beyond their capabilities. Second, it forces the Soviets to spread their defensive efforts to counter a wider range of threats, thus denying them the advantage of concentrating their resources on areas more threatening to us. The Triad has served us well in the past and will continue to serve us well in the future if we act promptly and prudently to address the vulnerabilities and deficiencies which are emerging as the threat continues to mount.

At the end of World War II, the United States had unchallenged military supremacy, including a monoply of nuclear weapons. Since then, the relative balance has shifted dramatically. When the Soviets achieved advantages in most measures of general purpose capability, we were still able to rely on our strategic force superiority to help maintain stability in the world. However, the Soviets have now fielded a strategic force at least equal to ours, making it more likely that they will exploit their advantages in general purpose forces. It should be understood that any imbalance in strategic forces, either real or perceived, provides added fuel for Soviet adventurism and makes meaningful, equitable arms control agreements more difficult. Unless the Soviet momentum is checked, we may witness a decisive shift in the military balance of power in favor of the Soviet Union by the mid-1980s. Such an imbalance, coupled with the Soviets' willingness to exploit it, would make the future even more dangerous and uncertain than the difficult past.

The relative shift in the balance of strategic power is no accident; it has resulted from a determined and sustained commitment by Soviet leaders. A significant disparity has existed for years between U.S. and Soviet spending for strategic forces. Since 1970, the estimated cumulative dollar costs of Soviet strategic force procurement exceeded that of the U.S. by 95 billion dollars (constant 1982 dollars). Our major challenge is to modernize the strategic Triad to maintain its deterrent value in the face of this substantial Soviet commitment to strategic force buildup. In short, we must proceed now with a vigorous modernization of our strategic programs.

Our modernization efforts are designed to take maximum advantage of U.S. areas of technological superiority, thus providing an adequate level of deterrence at lower cost. We must also consider, as best we can, potential Soviet initiatives and reactions. Underlying these efforts is our desire to provide a firm basis for pursuing our long range national goal of equitable strategic arms limitations.

In the following paragraphs, I will discuss the two legs of the strategic Triad for which the Air Force is responsible-land-based ICBMs and the bomber leg.

Land-Based ICBMs

The most critical and growing deficiency facing us today is the increasing vulnerability of our Minuteman and Titan ICBM forces. The ability of these forces to survive a nuclear attack is being rapidly eroded by the improved accuracy and increased number of Soviet ICBM warheads being deployed. These warheads have enough yield and accuracy to destroy any fixed target in the United States. Further, they are being deployed in large enough quantities to permit the Soviets to target two warheads on each of our ICBM silos. The result is that the Soviets now have the capability to destroy a large (and growing) percentage of our silo based ICBMs and still maintain a large residual force of weapons.

To redress the vulnerability problem, an advanced, survivable, land-based ICBM is required. M-X fulfills this need by providing a new, highly capable ICBM as well as a new concept in missile basing--multiple protective shelters (MPS). Thus, M-X offsets the growing Soviet threat to our fixed based ICBMs, alleviates a significant and growing asymmetry in future strategic capability, and helps maintain essential equivalence.

The M-X missile is slightly larger than twice the size of the Minuteman III. It will have a payload of 10 independently targetable reentry vehicles (with a capability of up to 12), will be more accurate than the improved Minuteman III, and although the basing mode is currently being reviewed, we have been planning since 1979 that the M-X will be deployed in a multiple protective shelter (MPS) basing mode. The MPS concept provides survivability through concealment and mobility of the M-X missile encased in its mobile launcher. Each missile and its launcher would be deployed within a cluster of 23 shelters and can be moved among those shelters to preserve location uncertainty. With a planned deployment of 200 missiles, 4600 shelters will be included in the system. In order to attempt destruction of these missiles, the Soviets would have to target all 4600 potential missile locations. This creates an unfavorable exchange ratio for the Soviets in that they would have to expend at least 23 warheads in order to destroy 10 to 12 of ours. Assuming our forces are near parity, such an attack would be a losing game for the Soviets. Moreover, the number of surviving M-X reentry vehicles can be held constant in the face of larger-than-expected Soviet threats by constructing more protective shelters, more missiles, or, in the extreme, a ballistic missile defense system. In simple terms, the concept of M-X based in MPS is founded on arithmetic, as opposed to technology. Survivability, then, is largely the function of the number of shelters and not the number of missiles deployed. Hence, M-X in the MPS basing mode is well suited to support our long term arms control objective of maintaining a secure, flexible retaliatory capability at significantly reduced force levels.

The Command and Control system planned for M-X achieves survivability with an Airborne Launch Control Center (ALCC). Our pre-attack Command, Control, and Communications (C^3) systems are not expected to withstand a nuclear attack. The ALCC will be outfitted with an M-X C^3 suite, personnel, and equipment necessary to survive a large-scale nuclear attack on M-X.

The C^3 suite in the aircraft will provide two-way secure communications with the M-X launcher and the operations control center. It will also be in contact with Headquarters Strategic Air Command (SAC) and the Post-Attack Command and Control System via the World-Wide Military Command Control System (WWMCCS). With this capability, the ALCC will provide enduring command and control of the M-X system.

The M-X is presently in full-scale development which includes designing, fabricating and testing the M-X missile in the MPS basing mode. There are no procurement funds in 1981 or 1982; however, the research, development, test and evaluation program and the construction program will continue at a significant pace. We plan to request funds for the first phase of procurement beginning in fiscal year 1983.

Although development of the M-X commands our primary attention, important projects are underway to improve the effectiveness of our Minuteman and Titan forces. For example, we are continuing the procurement of the Mark 12A reentry vehicle (RV) for the Minuteman III force. The Mark 12A provides a higher yield warhead and improved arming and fusing capability for use against the ever increasing Soviet target base. In addition, procurement efforts are underway which support the Airborne Launch Control System (ALCS) Phase III program. ALCS Phase III will enable the airborne missile crews to monitor the status of and remotely retarget Minuteman III missiles. This new capability will provide our airborne crews with more flexibility for command and control. Also, in our ICBM C^3 Integration program, we are supporting fabrication and installation of equipment involving three communications systems. These efforts will increase the reliability of emergency war order reception and will ensure connectivity with other Single Integrated Operational Plan (SIOP) forces.

Finally, we have an on-going Minuteman/Titan modification program to update these in-service missile systems and associated ground support and training equipment. This includes reliability and maintainability improvements such as modification of logistically unsupportable Titan II launch equipment with state-of-the-art equipment, and replacement of worn-out Minuteman environmental control system brine chiller units with improved design, and energy efficient units at Minuteman missile sites. These modifications are required to maintain these missile systems in an operational ready condition. We are also replacing aging Emergency Rocket Communications System components with state-ofthe-art electronic components and updating a Minuteman outer zone security alarm system to reduce false alarm rates. In addition, the fiscal year 1982 program initiates several important safety modifications to the Titan II force.

Although the number of Titan II missiles is relatively small, these weapons represent over one-third of the total nuclear yield currently available from the land based ICBM force. The weapon system initially deployed in 1962 is operated by the Strategic Air command (SAC) to cover targets assigned by the National Command Authorities (NCA) in the Single Integrated Operational Plan (SIOP).

Following the recent Titan II accident at Damascus, Arkansas, a critical review of the Titan II weapon system was performed at the direction of the Secretary of the Air Force. This critical review was not to investigate the accident, but rather to provide an overall assessment of the Titan II, with particular emphasis on its safety and supportability. The review group found that since its initial deployment, the missile and related support equipment have been adequately maintained and kept current to meet safety and operational requirements. Launch crews and maintenance teams have the technical knowledge and training to ensure the safe, effective operation of the system. The results of the review were provided to Congress in January 1981, with the overall conclusion that the Titan II is safe and supportable. However, we have a number of actions we are taking, to include modifications, to ensure the future safe effective operation of the system.

The Bomber Leg

A percentage of our bomber force is kept on alert to provide us with second-strike capability. Our tactics include penetration of Soviet defenses at low altitudes using electronic countermeasures (ECM) to confuse enemy ground radars. We would also use short range attack missiles (SRAM) to attack critical targets from standoff positions beyond the effective range of terminal defenses. However, the Soviets are modernizing their forces to include a new airborne warning and control aircraft, new interceptors with a look-down, shoot-down capability, as well as new missiles that will make our task more difficult.

When these new systems are fully deployed, they will significantly reduce our probability of reaching Soviet targets with our current forces. We must continue to improve existing systems and develop new ones which are capable of surviving dense and sophisticated air defenses.

Our most significant new initiative in this area is the definition of a follow-on Long Range Combat Aircraft (LRCA). The B-52 has been the backbone of the bomber leg of the Triad for more than a quarter century. It has also proven itself in a conventional role in Vietnam. However, the increasing complexity of Soviet defenses makes it imperative that we pursue a new strategic manned aircraft that can be effective against modern defenses in either nuclear or conventional scenarios on a worldwide basis. This new Long Range Combat Aircraft must provide the flexibility and responsiveness inherent in airpower: it must be able to fly long distances, carry large diversified weapons loads, provide a self-contained capability for target acquisition and weapon delivery, defend itself against sophisticated air defenses, and most importantly, provide a platform for onscene, human judgment throughout the mission.

The Air Force is currently involved in defining the new LRCA consistent with Congressional direction contained in the Department of Defense Authorization Act, 1981. Estimates of development/production costs, schedules, and aircraft performance for candidate aircraft are currently being evaluated as we pursue the initial activities leading to development of a follow-on strategic aircraft. Upon reaching a decision on the appropriate aircraft and its configuration, we will then be procuring long lead items and critical parts such as engines, major assemblies, avionics, and forgings.

In the near term, our major modification effort for the bomber leg of the Triad will be the introduction of large numbers of Air Launched Cruise Missiles (ALCM) which will be initially carried on modified B-52Gs. The offensive potential of this integrated force provides a credible strategic deterrent to support our national policy. To achieve this capability the B-52 aircraft must be modified and updated to counter the latest threat possibilities, to maintain aircraft effectiveness and reliability, and to keep the weapon system logistically supportable.

Our procurement efforts are largely devoted to obtaining offensive avionics system modification kits for the B-52G and H, and kits for an external cruise missile carriage capability for the B-52G. The updated offensive avionics will improve accuracy and weapon system effectiveness while solving many of the reliability problems of the bombing navigation system. The B-52G cruise missile carriage is necessary for increased strategic offensive capability. The remaining procurement effort is about equally applied to funding operational improvement and reliability modifications.

The ALCM, currently in full production, will make a major contribution to the bomber leg of the Triad by providing greater weapon accuracy, flexible routing and targeting, reduced exposure to enemy defenses, and saturation of defenses. The deployment concept is to initially retain the current B-52G internal load of gravity bombs and Short Range Attack Missiles (SRAMs) while loading 12 ALCMs externally on two jettisonable pylons per aircraft. This weapon mix supports the Strategic Air Command's "shoot and penetrate" concept, helps prevent the Soviets from optimizing their defense against the bomber or the cruise missile, and provides maximum deliverable megatonnage and weapons on our bomber forces during the ALCM transition.

Tanker aircraft are a vital part of the bomber leg and they support our conventional forces as well. Ongoing structural modifications, including the wing reskin program begun in 1974, will ensure that the KC-135 remains structurally airworthy well into the next century; however, it will require modernization for specific operational and environmental deficiencies. Our current major effort is to reengine the aircraft with modern technology engines.

The reengined KC-135 will provide substantial improvement over the existing aircraft which will help satisfy growing tanker requirements. Fuel offload capability at all refueling ranges will be increased and engine thrust will be improved. This provides increased operational flexibility by eliminating the current dependence on extremely long runways. Only six airfields in the CONUS have runways long enough to accommodate the KC-135A at maximum gross weight under peacetime safety criteria. To take off from a base with a 10,000 foot runway (there are about 75 in the CONUS), a KC-135A must actually take off with approximately 30,000 pounds of fuel less than its maximum capacity. This results in reduced aerial refueling offloads and the generation of additional KC-135A sorties.

Additionally, the reengined KC-135 is 25 percent more fuel efficient, six times quieter, and substantially less polluting than the current aircraft engines. If all KC-135As were reengined, approximately 110 million gallons of fuel per year would be saved at a five year savings of over 614 million dollars (assuming a constant fuel cost of $1.11 per gallon). The reengined KC-135 will meet or exceed the Federal Aviation regulation for noise and pollution, while the present engine does not meet standards by a significant margin. Although military aircraft are presently exempt from the regulation, (which will be mandatory for all civil aircraft by 1985), noise and smoke have been a major source of tension with the public.

STRATEGIC DEFENSE

Strategic defense is an integral part of our strategy of deterrence. In particular, timely and reliable warning and assessment of an attack is essential in order to properly launch and direct our fighting forces or disperse our strategic offensive forces. Strategic defense for the Air Force is achieved through critical, important and complementary programs which are contained in three subdivisions of the mission area: atmospheric warning and defense, missile surveillance and warning, and space surveillance and defense.

Atmospheric warning and defense programs provide tactical warning, active defense, and airspace control. Should a potential hostile threat be identified by our atmospheric warning systems during day-to-day monitoring of the approaches to the continental United States, assigned interceptor forces and AWACS aircraft scramble to intercept and achieve positive identification. However, Existing North American bomber/cruise missile sensors have coverage gaps and can be underflown. In addition, these sensors do not reliably detect targets such as cruise missiles which have small radar cross sections. Based on the growing Soviet bomber and cruise missile threat and our limited surveillance capability, there is an urgent need for a complete modernization of our warning systems. Our RDT&E budget request addresses the programs in this area to improve our capabilities.

Missile surveillance and warning is accomplished by space-based sensors and cross-checked by a collection of ground based radars. In the event of war, timely, reliable warning and assessment of a ballistic missile attack is imperative in order to provide the National Command Authorities with necessary information to select an appropriate, timely response. In our RDT&E program we are developing an upgrade to our Ballistic Missile Early Warning System to increase both its capacity and accuracy.

United States space surveillance and defense programs provide the capability for monitoring and giving relevant information on resident space objects. They also support United States manned and unmanned space activities by monitoring national compliance with various treaties. The incessant growth of Soviet space capabilities in jamming and antisatellite activities is a primary impetus for improving the United States space surveillance and defense role in the strategic defense mission area. More specifically, some alternatives to expand our coverage and provide more responsive assessment of Soviet space activities will be discussed in our RDT&E budget request.

Procurement costs related to interceptor forces are included in the counter air and command, control and communications (C^3) mission areas. Most of the procurement costs in the strategic defense mission area are those related to the Defense Support Program (DSP). The DSP is a vital element of the nation's strategic defensive system. The DSP satellites provide mission data to dedicated ground stations for processing and development of mission messages. These messages are transmitted in near-real time to the National Command Authorities, North American Defense Command and Strategic Air Command. Data is also provided to additional users via teletype communications lines. Operational control is maintained by Aerospace Defense Command.

During their operational life all satellites fail or degrade beyond the point of being able to accomplish the mission. In order to maintain the operational capability of this vital system, new satellites must be procured to replace those that have failed or worn out. Based on a Defense Systems Acquisition Review Council (DSARC) decision in February 1980, a potential follow-on program to the DSP will be in a technology development status for several more years. This schedule means that the follow-on could not be operationally deployed until at least the early 1990s. At least four more Defense Support Program satellites will be required to provide the current capability until that time period. Our procurement plans are based on this requirement.

III. GENERAL PURPOSE

For the United States to be capable of protecting its worldwide interests we must be able to respond with military power when our interests, or those of our allies, are threatened and military force is deemed appropriate. The erosion of United States strategic nuclear superiority has reduced the deterrent value of the nuclear umbrella as well as increased the reliance upon and the contribution of conventional forces to our overall deterrent strength.

The primary threat to our general purpose forces continues to be the Soviet Union/Warsaw Pact. The Soviets have for many years outnumbered us in conventional forces. They recognize the value of strong, flexible conventional forces and have been investing much more than we have to modernize and improve their ground forces and tactical air forces. Even though we have had qualitatively superior tactical aircraft, missiles and target acquisition systems, the Soviets are now only a step behind us. Their continued rapid introduction and production of new, more modern and sophisticated tactical systems may soon have us facing a force that is not only vastly superior numerically, but one that is comparable qualitatively.

As Soviet military capabilities have grown, so has their adventurism. While we cannot accurately predict Soviet intentions, recent events, such as the Soviet invasion of Afghanistan, seem to indicate that their intentions are a function of their capability and opportunity to expand their influence. The recent Soviet aggression has vividly highlighted the need for a flexible and well-balanced U.S. force of sufficient size and capability to meet contingencies worldwide, while simultaneously protecting our interests at home and in western Europe. A modern, well equipped tactical Air Force will play a major role in deterring and countering any potential threat.

Our emphasis this year in the General Purpose forces area is on mobility programs and procuring spares and repair parts for our forces in the field. In addition, we are continuing past efforts to work with our allies to achieve compatability in weapons development and deployment. We strongly support, and many of our programs reflect, our commitment to NATO rationalization, standardization, and interoperability (RSI). RSI should increase the overall capability of the alliance--now and in the future.

Our programs are categorized into five mission areas: close air support/battlefield interdiction, counterair, defense suppression, reconnaissance, mobility, and other. I will review each of these mission areas and highlight the programs of major interest.

CLOSE AIR SUPPORT/BATTLEFIELD INTERDICTION

The most demanding conventional threat facing the United States is an armored attack on Western Europe by the Warsaw Pact. Soviet strategy calls for around-the-clock operations designed to cause the quick collapse of NATO forces. The Soviets, in open writings, say that they intend to seize the initiative early. With NATO forces in defensive positions, we can expect the Soviets to launch a classic breakthrough attack to establish their preferred form of combat--a war of movement. Soviet doctrine requires that their forces move as rapidly as possible. By combining mobility and massive firepower, they intend to keep NATO forces off balance and confused. The Soviets have built and trained their forces this way and they have equipped them accordingly.

NATO plans rely heavily on the flexibility of tactical air power to be able to shift combat power rapidly to threatened sectors. To defend their forces from NATO air power, the Soviets/Warsaw Pact have equipped their forces with a lethal integrated and mobile air defense system. In addition, Warsaw Pact forces can be expected to take advantage of their demonstrated capability to conduct operations at night and in adverse weather where NATO tactical air systems are expected to be less effective. Our tactical Air Force must not only aid in blunting an attack along the forward line, but must also provide the capability to delay, disrupt, and destroy enemy reinforcements and resupply. Our A-10, F-16, Low Altitude Navigation and Targeting Infrared System (LANTIRN), Maverick, and 30MM gun pod procurement programs will help us achieve this capability.

The A-10 and F-16 aircraft are especially suited to blunting an attack and provide capabilities to delay and disrupt the Warsaw Pact forces. The A-10 aircraft has a rapid firing gun which is very effective against hard mobile targets, such as tanks, and can carry a full range of conventional ordnance. With its GAU-8 30MM cannon and Maverick air-to-surface missiles, the A-10 aircraft is the most lethal anti-armor weapon system available. The Air Force has accumulated over 250,000 operational flying hours in the A-10. As of 31 January 1981, we have taken delivery of 450 aircraft. All six of the planned USAFE squadrons are now operational, flying from their main operating base at RAF Bentwaters-Woodbridge, as well as from four peacetime forward operating locations in the Federal Republic of Germany. Four of the five planned Air National Guard squadrons are now operational, as well as the first of four Air Force Reserve squadrons. This is one of the few occasions that substantial numbers of new first-line combat aircraft have been delivered to active, guard, and reserve units concurrently.

The F-16 coproduction program is an example of our efforts towards standardization and interoperability with our NATO allies, in order to achieve an effective NATO deterrent at an affordable cost. The internally mounted 20 millimeter M61 gun, two to six wing-mounted AIM-9 air-to-air missiles, and the capability to carry approximately 12,000 pounds of air-to-surface ordnance and stores with full internal fuel make the F-16 an excellent weapon system in both air-to-air and air-to-ground roles. In the first quarter of fiscal year 1981, the F-16 attained initial operational capability when the 4th Tactical Fighter Squadron of the 388th Tactical Fighter Wing, Hill AFB, Utah, achieved combat ready status. By the end of fiscal year 1981, we expect to have delivered 305 production aircraft and to have activated seven of 34 projected operational squadrons.

Despite its superior performance, the aircraft has limitations. It has no radar missile and is limited in night attack capabilities. Because the F-16 will replace the F-4 aircraft, which has a limited beyond-visual-range capability with a radar missile and limited night attack capability with a laser designator (PAVE SPIKE/PAVE TACK), the Air Force considers the Advanced Medium Range Air-to-Air Missile (AMRAAM), the Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN), and certain F-16 radar improvements to be essential in countering the projected threat in the mid-late 1980s.

Radar improvements initiated in fiscal year 1980 are designed to provide improved air-to-air and air-to-surface capabilities. The improvements include a digital programmable signal processor and a higher power transmitter. The programmable signal processor and new transmitter will increase radar detection range, allow multiple target discrimination, and counter hostile jamming. Production of the radar improvements will be initiated in fiscal year 1983, allowing for production line incorporation in early fiscal year 1985. We are also continuing production line incorporation of structural and wiring provisions for improved weapon systems and sensors needed for the F-16 in the mid 1980s and beyond.

LANTIRN, which will be used on the A-10 as well as the F-16, is one result of our emphasis to improve our capabilities to operate at night and in adverse weather. LANTIRN is an automated air-to-ground electro-optical fire control system. It integrates Heads-Up Display (HUD), Forward Looking Infrared Receiver (FLIR), radar, laser and micro-processor computer technology into a two-pod system for navigation and targeting. The navigation pod is designed to provide essential information for the pilot to fly at low altitude and at night to avoid enemy defenses while the targeting pod acquires and recognizes battlefield targets. This capability represents a major breakthrough and allows a quantum jump in selective high-rate kill technology. The LANTIRN system will be able to designate for laser guided weapons delivery and in addition will provide target acquisition for the imaging infrared (IIR) version of the Maverick missile.

We are procuring the IIR Maverick missile because it will expand our ability to destroy small, hard tactical targets during night and adverse weather conditions. It will complement the daylight only TV Maverick currently in the inventory, and the laser version being developed for the Marine Corps. The Maverick, which is a self-guided, rocket-propelled, air-to-surface missile, is used in the close air support, interdiction, and defense suppression missions. The missile can be carried externally on the F-4, A-7D, A-10, F-16 and the F-111F.

The 30MM gun pod is being procured to provide attack aircraft (other than the A-10) with an effective multiple-kills-per-pass capability against armor. This capability is expected to reduce exposure to the highly lethal Soviet/Warsaw Pact ground air defense systems and to counter a Soviet ground offensive. This pod, which will be available soon, uses the same ammunition as the 30MM gun in the A-10, and it is planned to be carried on the F-4, A-7, and F-16 aircraft.

Finally, the potential exists that a conventional war could escalate to include the use of theater nuclear weapons. Our Ground Launched Cruise Missile (GLCM) program is designed to provide deterrence and survivability against this potential. The requirement for GLCM stems from emerging trends which have caused concern among the NATO Allies about the credibility of the Alliance's nuclear deterrent. As I mentioned earlier, there has been the adverse trend in strategic nuclear forces. In addition, the Soviets have strengthened their long-range theater nuclear forces significantly through the deployments of the SS-20 ballistic missile and Backfire bomber. In response, the Alliance reached a collective decision in 1979 to adopt a combined program of long-range theater nuclear forces modernization and arms control on behalf of NATO. Under the terms of this program, the Alliance will move ahead with deployments of the Army's Pershing II ballistic missile and the Air Force's GLCM, while concurrently advancing theater nuclear arms control proposals.

COUNTERAIR

The U.S. and its allies are facing a clear challenge presented by the Warsaw Pact air threat. As I mentioned before, the character of Soviet tactical air has changed from primarily a limited range defensive force to a formidable, long range offensive force. They have the capability to conduct fully supported strikes against airfields, nuclear storage sites, support installations and command and control facilities anywhere in European NATO.

At the same time the Soviets have not neglected the defensive capabilities of their tactical air. Their fighters are already equipped with radar missiles similar to our AIM-7s that give them a substantial beyond-visual-range capability. In addition to counter NATO attack fighters and NATO low altitude penetration tactics, the Soviets are developing a look-down, shoot-down capability. We expect to see such a capability fielded by the early 1980s. It is clear that in any conflict our forces will encounter a large number of new generation high performance Soviet fighters equipped with sophisticated avionics and weapons.

To meet this challenge, the Air Force must continue to procure highly capable fighter aircraft, as well as seek further improvements such as look-down, shoot-down capability to maintain our technological edge. We plan to continue acquiring the F-15 as well as the F-16 aircraft mentioned earlier, and to make improvements in these aircraft where necessary.

Our F-15 is an advanced tactical fighter designed specifically to counter post-1975 Soviet aircraft. A long range look-down radar, air-to-air missiles, and the M-61 rapid firing 20mm cannon, provide the F-15 with an outstanding close-in visual and medium range all-weather kill capability. It has replaced the F-4E as the primary air superiority fighter in the tactical air forces. At the end of fiscal year 1981, we expect to have delivered 603 production aircraft and to have activated 16 of 19 operational squadrons.

There has been some concern that the F-15 is too sophisticated to meet its mission requirements. Let me assure you that this is not the case. During surge exercises, the F-15 has consistently demonstrated a capability to generate the high sortie rates required during combat conditions. The F-15's sophistication provides unique beyond-visual-range capabilities which are not available in any other aircraft. This sophistication, however, has not caused the majority of F-15 downtime. The most significant impact has resulted from lack of spare parts for systems typical of other fighter aircraft; test equipment shortfalls, and engine supportability. We are in the process of solving our spare parts problems. As I indicated earlier, we have given this our increased emphasis during the formulation of the budget.

To keep pace with the rapidly growing threat to our air-to-air fighters, the Air Force will equip both the F-15 and the F-16 with the Advanced Medium Range Air-to-Air Missile (AMRAAM). AMRAAM is now in development and we expect a production decision by fiscal year 1965. This new missile provides marked improvement over our present systems. This will include such capabilities as launch and maneuver, increased speed, shoot-down, and multiple target attack during a single intercept. But for now, we need to address our present inventory shortfall of air-to-air missiles, and as a result, our procurement request for air-to-air missiles has been significantly increased over last year's fiscal year 1982 estimate.

The primary adverse weather air superiority armament for our F15 aircraft is the AIM-7F/M Sparrow air-to-air missile. To employ the Sparrow, a target is identified by the launch aircraft's radar, the missile is launched and guides to the target using reflected radar signals. The AIM-7M, the latest version, has an advanced monopulse seeker which provides improved electronic counter-countermeasures capabilities, and better look-down, shoot-down capability than the AIM-7F. These improvements provide an increased capability to kill low altitude targets.

The larger number of enemy aircraft, along with their associated armament, makes it imperative that we have some way to even the odds for our aircraft. Sparrow performs a key role in providing this capability by giving us the ability to attack enemy aircraft at medium beyond-visual-ranges. Because of a critical shortage of these medium-range missiles, our plan is to continue to procure the AIM-7 Sparrow until the more capable AMRAAM is available. Our near term objective is to increase the number of missiles available to our operational forces and to correct our current inventory shortage.

The AIM-9L/M Sidewinder is an air-to-air "dogfight" missile being jointly procured by the Air Force and Navy. It is our primary within-visual-range air superiority armament for both the F-15 and F-16. In comparison to the AIM-7, the Sidewinder is shorter range and is heat seeking rather than radar controlled. Its envelope complements the use of guns and the medium range Sparrow missile. Several variants of the AIM-9 have been produced, and the AIM-9L is the current version in production. Our NATO allies will also be equipped with this missile and a NATO consortium is preparing to produce it. As with the AIM-7 Sparrow, we have a severe inventory shortfall of the Sidewinder. Our immediate objective is to increase the quantities on hand to improve our operational readiness.

DEFENSE SUPPRESSION

The Soviet air defense system has been growing in density, quantity, and complexity. The Soviets have continued to develop and deploy new tactical and strategic Air Defense systems, Surface-to-Air Missile (SAM), Anti-Aircraft Artillery (AAA), and airborne interceptors. These new tactical systems emphasize mobility comparable to the tactical forces they accompany and are designed to protect. They use both radar and electro-optical means for target acquisition and tracking.

Growth in the Soviet air defense capabilities has also been marked by increased reliance on Command, Control, and Communications (C^3) as they strive to maintain a highly reliable and efficient integrated system. Training and operating within this highly controlled and integrated Air Defense System is a basic and critical part of Soviet battlefield management.

Because of this growing Soviet threat we have and will place increased emphasis on defense suppression. Our objective in defense suppression is to achieve an effective mix of systems which degrade, deceive, or destroy the enemy's air defense network. Our goal is to safeguard, as much as possible, our aircrews and aircraft. To accomplish this we have programmed for updates to our operational defense suppression systems, as well as stressed the development of new systems to handle the highly sophisticated Soviet threat.

Our primary defense suppression system, for destruction today, is the F-4G Wild Weasel and we intend to update this capability. We are also continuing with the Navy in the joint High Speed Anti-Radiation Missile (HARM) program for use on the F-4G. The HARM will be used against surface-to-air missile radars, early warning radars, as well as air defense artillery. Anti-radiation missiles currently in the inventory (AGM-45 Shrike, and AGM-78 Standard ARM) are ineffective against the current threat. HARM can defeat not only the present but also the projected more sophisticated threat emitters.

In addition, we plan to expand our kill capability through the use of relatively low cost expendable tactical drones under our Locust program. Equipped with a seeker-warhead payload and ground launched in large numbers, these vehicles will be programmed to fly to areas where enemy radars are known to be operating. Once in the target area, the Locust vehicle will acquire, guide to, and destroy target radars with a fragmentary warhead.

While these programs represent significant improvement in our ability to destroy the enemy's air defense network, additional capability will be offered by the Precision Location Strike System (PLSS), which is currently in development. When deployed, this system, in conjunction with the TR-1 aircraft discussed in the next section under Reconnaissance, will offer us the unique capability to precisely locate and strike time-sensitive threats and key command and control elements.

In the area of Electronic Warfare (EW) we are continuing emhasis on both support and self-protection electronic countermeasures (ECM). For support jamming our emphasis is on the EF-111A modification program in order to counter the Soviet early warning ground control intercept and acquisition radars. This aircraft will provide us with both a standoff and penetrating jammer capability. In addition, to counter the improved Soviet C^3 network, we are placing heavy emphasis on tactical C^3 countermeasures. Specifically, our immediate emphasis is on Compass Call, an EC-130H aircraft designed to disrupt selected portions of the Soviet force management system, causing loss of control of their forces. Our procurement program involves obtaining modification kits for airframes.

For self-protection ECM, we will be increasing the procurement of ALQ-131 pods in line with the fiscal year 1981 Congressional action, as well as continuing with our staged improvement plan to keep the ALQ-131s current with the threat. Additionally, we are updating our radar warning receivers to alert our aircrews of impending attack. We are also reducing the proliferation of EW equipment, an earlier Congressional concern, through the joint development with the Navy of the Airborne Self-Protection Jammer (ASPJ) for the F-16. We will continue to carry ECM pods on the F-16 until the ASPJ is available. This decision is based upon careful assessment of many factors, including availability, cost, logistics, support, NATO rationalization, standardization, and interoperability (RSI).

RECONNAISSANCE

The timeliness and accuracy of intelligence derived from our reconnaissance systems is becoming more important due to the improved mobility and sophistication of Soviet weapons systems. In addition, these reconnaissance systems contribute to the delay and destruction of key targets on the battlefield. Therefore, more than ever, NATO forces will be heavily dependent on reconnaissance and surveillance capabilities to minimize the likelihood of surprise, and to plan, move, and concentrate forces to counter the Warsaw Pact forces. These systems are also important to general U.S.combat capability wherever and whenever it might be employed.

To meet the needs of the tactical commanders for near real time information, we plan to continue procurement of the TR-1 aircraft, a tactical version of the U-2R. The TR-1 is specifically designed to satisfy our requirement for a more continuous, high-altitude, standoff tactical surveillance capability. The aircraft will be equipped with the latest sensors being developed in other programs. These sensors, along with associated ground stations, data link and radio relays, will provide continuously available, day or night, all-weather surveillance of the battle area in near real time.

The TR-1 aircraft will also support the Precision Location Strike System (PLSS) mission. A modular payload design and common aircraft wiring will permit rapid payload changes. Although each aircraft is capable of carrying either PLSS or the reconnaissance payload, the PLSS and radar payloads cannot be carried at the same time. Configuring the TR-1 to support both the reconnaissance and PLSS missions is consistent with Congressional direction to avoid acquisition of aircraft dedicated solely to the PLSS mission.

Until delivery of the TR-1 aircraft, the RF-4C remains our only tactical reconnaissance aircraft. Recent improvements to the RF-4C have included the UPD-4 Side Looking Airborne Radar (SLAR) with extended range and data link, Pave Tack, the ARN-101 Digital Avionics Set, the AAD-5 infrared sensor, and the Tactical Electronic Reconnaissance (TEREC) system.

The TEREC system detects, identifies and locates in near real time, critical anti-aircraft threat emitters, such as surface to air missile and radar directed anti-aircraft guns. TEREC records all parameters of each detected threat emitter for later exploitation, and simultaneously data links to ground receivers the type and location of those programmed as the ten highest priority threats.

Recorded parameter data will be processed on Imagery Interpretation (II) segments of the Tactical Information Processing and Interpretation (TIPI) system. In addition, four of these segments will be able to receive the data link on priority emitters. We plan to continue procurement of TEREC remote terminals under the other procurement (3080) appropriation, providing a significant improvement to our present capabilities for disseminating critical radar emiting threat data to the tactical commanders.

The TEREC program provides the only passive, all weather, near real time reconnaissance system directly responsive to the tactical forces commander. It is directly tasked by him for last minute confirmation and update of the anti-air threat mix that would confront a given strike mission, thus permitting either threat avoidance or selection of appropriate defense suppression measures.

MOBILITY

Soviet adventurism coupled with instability in the third world countries requires us to maintain the ability to project military power. Our strategy relies on modest levels of prepositioned equipment and forward deployed forces while the majority of our forces are retained as a strategic reserve in the continental United States (CONUS). Projecting our CONUS based people, combat equipment, and supplies requires both airlift and sealift. However, airlift is the most visible, responsive, and flexible method of moving forces to wartime locations and potential trouble spots. It is a necessary ingredient to the successful operation of our Rapid Deployment Joint Task Force.

Under almost any scenario, airlift will be needed to project and sustain combat forces until other means of transportation can deliver the required follow-on support. In many situations, airlift is the only means of providing a timely response. This is especially true when the threat develops either rapidly or in remote locations. The possible denial of landing rights coupled with declining United States influence in several countries mandates our ability to deploy forces over long distances directly to the objective area.

Present airlift capabilities fall drastically short of providing adequate lift for simultaneous responses to both a contingency in Europe and one in another area, such as the Persian Gulf region. Our most serious airlift shortfall lies in the area of transporting outsize equipment such as tanks, infantry fighting vehicles, and mechanized artillery pieces. This outsize equipment is the firepower muscle of our modern Army. To extend the life of our only aircraft capable of transporting outsize cargo, we are requesting funds to provide a strengthened wing for our 77 C-5As. The wing modification of this essential aircraft will ensure the continued availability of the C-5 force by providing a 30,000 hour wing service life compatible with the service life for the remainder of the aircraft structure. Our first aircraft is scheduled to enter the modification line in fiscal year 1982. We are also planning other modifications to the C-5A to include an improved weather radar and a fuel saving advisory system to increase the aircraft's safety and efficiency.

However, we still require additional outsize cargo capacity in an aircraft that can operate over long ranges and can conduct sustained operations from small, austere airfields within the objective areas. We are continuing development of such an aircraft, now called the C-X. In fiscal year 1983 we plan to request procurement funds for long lead materials.

We also have a significant shortfall in our capability for long range airlift of non-outsize cargo. Improvements to the C-141, to include the stretch of the aircraft, are being accomplished with previously provided funds to help reduce the shortfall. Fiscal year 1982 funds for the C-141 will continue needed improvements in several on-board systems to include the fuel savings advisory system. We have also requested fiscal year 1982 funds to continue the Civil Reserve Airlift Fleet (CRAF) enhancement program, a most cost effective approach to reducing our oversize and bulk capacity shortfalls. Our program calls for the addition of military cargo convertible features during the initial fabrication of civil passenger aircraft or retrofit to the most recently built aircraft.

We continue to have a need for intratheater mobility and resupply. This is especially critical to our ground combat forces who are expected to be outnumbered. These forces may need to move rapidly to new battle zones when they develop. The C-130 has been the backbone of our intratheater airlift force, and we are requesting funds to continue modifications to include replacement of the outer wing boxes to assure the safe operation of this aircraft through the year 2000.

Along with airlift, aerial refueling is essential to a successful deployment operation. The KC-10As will help to reduce our dependence on foreign bases and enhance our capability for the rapid deployment of combat forces.

Airlifter cargo loads can be greatly increased and delivery times to the destination reduced through use of the KC-10A because of its large fuel offload and long range capabilities. The KC-10A will also help to free up the KC-135 tanker which is required to support the strategic bomber force. However, KC-135s will still be needed during a crisis to assist in the deployment and employment of tactical fighter forces and to provide critically needed refueling to airlift forces.

These programs do not duplicate each other, but are complementary. Our modification programs among the various aircraft consistently provide for needed safety requirements, fuel saving devices, and measures needed for successful operations.

OTHER

The last general purpose mission area is comprised primarily of special classified programs, discussed in separate hearings, and the Rapier surface-to-air missile program.

Currently, there is no point defense against attacking aircraft for USAF bases in the United Kingdom. In the event of war in Europe, U.S. bases in the United Kingdom would be high priority targets for enemy strike forces because we provide the principal U.S. nuclear air-to-surface capability for NATO. The U.S. Air Force will procure these British developed short range air defense missiles and a Royal Air Force (RAF) regiment will operate them for the protection of USAF air bases. In addition to the missiles, we will procure test and support equipment and pay for contractor maintenance and restocking of spares. The United Kingdom will pay for manning and training of the RAF personnel needed.

IV. SPACE

Our military forces have become heavily dependent on the information derived from space systems. Effective operations on the modern battlefield are increasingly a function of surveillance, warning, communications, meteorological, and navigation support obtained from satellites. The programs in the Space mission area provide the launch and orbital support for these vital space systems and include space programs not allocated to other mission areas.

The Soviets are well aware of the military utility of operating in space and have committed significant resources toward a sizable space presence. Over the last decade, Soviet space launches have exceeded those of the U.S. by a factor of three and one-half to one. The majority of these launches have been for military purposes.

Some of this difference is due to Soviet satellite designs which are generally less reliable than ours and, hence, are shorter lived. The Soviets are also supporting an active man-in-space program and they have deployed and continue to test an operational anti-satellite capability.

On the other hand, we are concentrating our efforts on doing more with each launch. We are supporting the development of a new space launch capability and we are improving our space operations capabilities.

Our future space launch capability, the manned, reusable Space Shuttle, is being developed by the National Aeronautics and Space Administration (NASA). We will be a major user of the Shuttle, which will provide major new capabilities to our space program. We are taking the necessary actions to transition our spacecraft from their current expendable launch vehicles to a Shuttle launch capability. We are also constructing or modifying those facilities and equipment which will be required for effective operational use of the Shuttle. Finally, we are requesting a significant portion of the funds necessary to equip the Vandenberg Shuttle launch site (to be used for polar and near polar launches) which we began construction on in fiscal year 1979. We will operate Vandenberg launch site for all users--civil and military-beginning in August 1984 as our contribution to the partnership with NASA in the operation of the Space Shuttle system.

The importance of our payloads to national security makes it essential that we maintain our current space booster capability during the period when we plan to transition our spacecraft to Shuttle launch and to provide a backup capability in the event of delays or any unanticipated problems in Shuttle availability. These capabilities are being supported by our Space boosters program.

Since the Space Shuttle Initial Operational Capability (IOC) at Kennedy Space Center was delayed, a gap was created between the time Titan III production capability would be lost and the time the Space Shuttle would be operational. In anticipation of possible delays, Congress approved a reprogramming request in fiscal year 1980 to begin maintenance of critical Titan III production capability until the Space Shuttle is operational.

The program strategy is to provide for the production of Titan III(34)D boosters using incremental decision points to advance these vehicles through major production stages which are keyed to critical Space Shuttle development milestones. This procurement approach maintains the key capability to deliver completed vehicles to accommodate critical launch requirements.

Also included in this mission area is the Space Launch Support program which provides the Inertial Upper Stages (IUS), Payload Assist Modules-Delta class (PAM-D), and spares support for all Air Force operational space programs (excluding Support Missions) launching on the Space Shuttle. The IUS and PAM-D are propulsive upper stages for transporting spacecraft from the Space Shuttle orbit to the higher orbits required by spacecraft missions. These systems can also be used with conventional launch vehicles. Operational programs supported include the Defense Support Program, the Defense Satellite Communications System, and the Navstar Global Positioning System (GPS).

Spares are being procured for Interface Verification Equipment and for the Vandenberg AFB Shuttle launch processing system. The interface verification equipment allows simulation of orbiter functions to verify payload cargo-to-orbiter interfaces and simulation of the IUS to verify IUS-to-payload interfaces. The Vandenberg AFB launch processing system is the equipment necessary to checkout and launch the Space Shuttle at Vandenberg AFB.

Our space operations segment in this mission area is small, but its single program, Defense Meteorological Satellite Program (DMSP), is vital to successful military operations. DMSP environmental information supports both strategic and tactical missions.

The DMSP is a joint service program which is DOD's most important single source of weather data. Two DMSP satellites are required to provide worldwide, high quality visual and infrared cloud imagery and other specialized meteorological data four times a day. These satellites provide data to the Air Force Global Weather Center at Offutt AFB, Nebraska, and to the Navy's Fleet Numerical Weather Center at Monterey, California. Local area cloud imagery data are transmitted for immediate use directly from the satellites to mobile Air Force and Navy tractical receiving terminals at key worldwide operating locations and onboard aircraft carriers at sea. Our procurement program involves acquisition of satellites, launch systems, and special sensors.

V. COMMAND, CONTROL, AND COMMUNICATIONS

Communications (C^3) systems are essential in accomplishing our theater missions, strategic defense, and the execution and control of our strategic offensive capability. In particular, C^3 systems, including our vital space assets, are critical to the control of escalation. Our C^3 systems enable and support decision making actions in essential wartime activities such as surveillance, allocation of firepower, and obtaining mobility and logistic resources. These systems also support day-to-day peacetime operations and are of special need during periods of tension and crises situations. This has been demonstrated, particularly following the takeover of the U.S. Embassy in Tehran, Iran, and during the war between Iraq and Iran.

Effective and enduring Command, Control, and Communications are an important element of U.S. strategy for countering numerically superior Soviet and Warsaw Pact forces. In response to our dependence on C^3, Soviet doctrine emphasizes disruption of our C^3 links. The threat includes physical and electromagnetic attack to achieve this objective.

Modern weapons today operate over extended ranges and can be brought to a target at extremely high speeds. This dictates significant improvements in the communications used to control our forces. Our C^3 procurement investments complement the research and development efforts underway to counter current and future Soviet threats and provide improved C^3 systems. This is done by sustaining the capabilities of our current systems through replenishment and by upgrading selected systems with new developments which satisfy operational requirements in a cost-effective manner.

Our C^3 capabilities must be improved to increase their effectiveness in combat and crisis, particularly their survivability and resistance to jamming and enemy exploitation. The C^3 investment in the fiscal year 1982 request satisfies a broad range of tactical, strategic, and defense-wide requirements by procuring systems and equipment for satellites, aircraft, and ground terminals.

Two of our most important programs are the E-3A aircraft and the E-4B aircraft. The E-3A aircraft provides mobile, survivable, jam-resistant, wide area radar surveillance along with highly sophisticated data processing, data relay, and communications capabilities. The basic requirement for the system stems from line of sight/terrain masking limitations and vulnerabilities of ground based radars in the face of continued growth in the threat from air and missile attack. Key advantages include comprehensive "deep-look" radar view of enemy air environment; force enhancement through radar controlled intercepts; and comprehensive display of air and maritime activity to support command appraisal/decision making. The result provides a powerful deterrent impact through warning assurance and war-fighting potential.

Twenty-three E-3A Airborne Warning and Control System (AWACS) aircraft have been delivered to the Tactical Air Command. The system, which supports worldwide tactical contingencies as well as the strategic atmospheric defense of North America, can operate independently of or in conjunction with ground-based warning and control systems. E-3A participation in tests and exercises has proven the system's capability to conduct both strategic air defense and tactical missions. During the last year, E-3As have been deployed to Korea, NATO, and Saudi Arabia to support U.S. interests abroad during periods of increased tension.

NATO nations have agreed to purchase the E-3 aircraft, giving additional capability to the defense of Europe and a step closer to alliance standardization and interoperability. In December 1978, the Secretary of Defense, along with eleven other NATO Defense Ministers, agreed to participate in the NATO Airborne Early Warning and Control (AEW&C) program as part of an overall effort to improve NATO air defenses and to counter the growing Warsaw Pact low altitude threat. The NATO AEW&C provides for 18 E-3A aircraft, modification of the ground environment to assure interoperability with the airborne components, and construction of basing facilities. The program also includes a contribution by the United Kingdom of 11 NIMROD aircraft.

The E-4 Advanced Airborne Command Post (AABNCP) provides the National Command Authorities and the Strategic Air Command with a highly survivable command and control system. The E-4 is a survivable emergency extension of the ground command centers and it provides high confidence in our ability to execute the Single Integrated Operating Plan (SIOP). The E-4B aircraft, modified Boeing 747s, represent a significant advancement over existing airborne command posts. Major improvements include hardening against nuclear effects, a more power ful low frequency communications system, new satellite communications systems incorporating anti-jam features, greater endurance, and an expanded operations team and battle staff.

The first E-4B was delivered to the Air Force in late 1979, completing the development effort. This aircraft is currently supporting both the National Command Authorities mission and the Strategic Air Command. A Milestone III review in May of 1980 resulted in a decision to proceed with the modification of three existing E-4A aircraft to the E-4B configuration and the production of two additional E-4B aircraft for a total force of six aircraft. Procurement of the last kit to convert the E-4A to the B configuration is included in our fiscal year 1982 request.

We have space-based programs such as the Defense Satellite Communications System (DSCS), the Navstar Global Positioning System (GPS), and the Satellite Data System (SDS) that require significant procurement dollars this year. These systems also support the operation and effectiveness of the aircraft I mentioned earlier, as well as other programs necessary in the successful operation of our forces.

The DSCS is a maturing, evolutionary Department of Defense developed to provide super high frequency (SHF) satellite communications for secure voice and high data rate transmissions. The DSCS is the major capability that satisfies our national security communications requirements for worldwide military command and control, crisis management, intelligence and early warning detection data relay, treaty monitoring and surveillance information, and diplomatic traffic.

The authorized space segment is comprised of four operational and two spare satellites positioned in synchronous equatorial orbit over four geographical areas to provide global (less polar) coverage to 72^{0} latitude. Our procurement program involves replenishing

DSCS II satellites with DSCS III satellites, which will provide increased channelization, flexibility, and Electronic Counter-Countermeasures (ECCM) capability. In support of our nuclear capable strategic forces, DSCS III satellites include an Air Force Satellite Communications System (AFSATCOM) single channel transponder (SCT) that operates at both ultra-high frequency (UHF) and super high frequency (SHF). This SCT is a receiver and transmitter relay used to broadcast Emergency Action Messages (EAM).

The AFSATCOM system is a satellite based communications system for command and control of the Single Integrated Operational Plan forces, other nuclear capable forces, and selected high priority users. The AFSATCOM space segment consists primarily of communications packages that share the Fleet Satellite Communications system (FLTSATCOM) and the Satellite Data System spacecraft with other missions. Terminals are being installed by the Air Force in the strategic bombers, reconnaissance and surveillance aircraft, ground and aircraft based command centers, and missile launch control facilities. The Army and Navy also are acquiring terminals that use the AFSATCOM space segment.

The AFSATCOM system is designed to function against modest levels of jamming. However, improvements are needed to satisfy the communications requirements of the strategic nuclear forces. The objective of these improvements is to provide adequate protection against jamming, increase the physical survivability of the space segment, and provide the needed communications capacity and coverage.

One of the near term improvements is the single channel transponder or SCT to be carried on the Defense Satellite Communications System (DSCS) Phase III spacecraft. We are currently refurbishing the qualification model SCT. In fiscal year 1982, the SCTs will be funded within the DSCS program because they are procured on the same contract from the DSCS satellite contractor. As a result, no fiscal year 1982 missile procurement funding is being requested for the AFSATCOM program.

The Satellite Data System is a major part of the Air Force Satellite Communications (AFSATCOM) system. Today it provides critical two-way transpolar command and control communications for our nuclear capable forces. In the 1982-86 time frame, the Air Force Satellite Communications payload on the Satellite Data System will continue to provide important UHF satellite Communications coverage for our strategic forces. The Satellite Data System also supports a data communications network among remote tracking stations and the Satellite Test Center (STC) for command and control of national space assets. We are procuring these satellites to sustain the orbital constellation and operational availability for the program's payloads.

The Navstar GPS is a space-based radio navigation network. By establishing a common positioning grid for air, land and sea forces, including reconnaissance elements, GPS will provide accurate positioning and information for the conduct of strategic and tactical warfare. This information will be used for command, control, and coordination of battle tactics; efficient battlefield maneuvers; accurate and timely fire support; all-weather, day and night weapons delivery; and tactical missile guidance. This system will help to minimize aircraft exposure to enemy air defenses by providing accurate navigational information on the way to the target.

The phasing of the acquisition funds and subsequent satellite buys are based on the Secretary of Defense approved program schedule leading to an 18-satellite constellation by early fiscal year 1988. The installation of all the 15,000-20,000 sets of user equipment to meet the needs of all services will extend into the 1990s.

Finally, as we become increasingly dependent on spaceborne systems to provide communications, navigation, and surveillance and warning for the worldwide employment of our strategic and tactical forces, these systems become increasingly lucrative targets to our enemies. Current Soviet technology could support the deployment of a substantial threat which would exploit the communications channels or interrupt the control links of our spaceborne systems. In addition, Soviet doctrine states the intent to employ such tactics. Since the use of all spaceborne systems depends on communications with earth based control stations for remote control or communications relay, Communications Security (COMSEC) devices must be procured to counter the electronic warfare threat against both these types of communications.

Encryption devices are being procured to prevent enemy exploitation of the communications relayed through spaceborne platforms. Anti-jamming and authentication devices are procured to prevent an enemy from interfering with our control of our spaceborne systems and also preclude any possibility of an enemy taking over that control. Additionally, our COMSEC procurements will be providing protection for telemetry data during research and development testing of weapons, such as the Advanced Medium Range Air-to-Air Missile (AMRAAM) and Wide Area Antiarmor munitions (WAAM). We expect continued and increased requirements from fiscal year 1983 through the outyears as additional systems are developed to support military activities from space.

VI. DEFENSE-WIDE MANAGEMENT AND SUPPORT

The defense-wide management and support programs generally influence or support other programs included in several mission areas. The investments here are extremely important and vital to the success and overall operation of the Air Force. Over 60 percent of these funds support classified programs which will be discussed in other hearings.

Included in this area are programs required to assist the Air Logistics Centers (ALCs) in the modernization of their equipment. Also included are programs to procure equipment such as aerial targets and instrumentation pods to support training and Operational Test and Evaluation (OT&E) ranges. In addition, we have programs to accomplish common modifications that are necessary for many of our aircraft. These modifications are not mission unique and include such things as update of radios and flight instruments. Finally, funds in this category support the extremely important Industrial Facilities program designed to provide and maintain a production base that private industry is unwilling or unable to provide. The program also facilitates investment in advanced manufacturing methods.

The depot plant equipment program supports our Air Logistics Centers (ALCs). We procure equipment used in centralized maintenance activities to modernize our plants and replace worn out equipment that supports various weapons systems. A variety of items are needed, including precise electronic measuring equipment. For fiscal year 1982 our request includes equipment to test wiring assemblies, a fuel accessory test stand, and equipment modules that will be used to inspect for cracks in jet engine turbine blades. This last item will help reduce costs on a labor intensive but extremely important task.

Aerial targets are being updated to simulate known enemy threats and procured to replenish the depleting stock of current assets. Our aircrews use these aerial targets to evaluate new air-to-air weapon systems, develop and test new tactics, and obtain realistic training in operational scenarios. The need for targets is a continuing requirement and our procurement plans are structured so as to ensure that targets will be available when needed.

Our multi-aircraft modification program represents a broad range of modifications that are not unique to a particular weapon system. They are designed to maintain present capability, improve performance, and/or lower support costs. An example is a program to replace high frequency (HF) single sideband radios in selected aircraft over several years. Current radios do not meet requirements for channel spacing, and frequency accuracy, and are of tube design with high support costs. A newly standardized radio will reduce logistics support costs. A similar program involves the installation of a new standard combined altitude radar altimeter. By improving the reliability and thus availability of these components, a significant improvement in peacetime operational readiness is realized.

The health and capability of the defense industrial base determines the quantity and quality of weapon systems that the Air Force can acquire, as well as the cost and time required for development and acquisition. In these times of unprecedented stagnation of industrial productivity, increasing lead times, growing dependence on foreign sources for critical materials and parts, low levels of capital investment and rapidly escalating costs, the Industrial Facilities program is a unique and increasingly essential element in the maintenance of our national security and military posture. The program must provide the resources necessary for ensuring that the defense industrial base is responsive in meeting both the current and planned production needs of Air Force weapon systems.

The program accomplishes its objective in primarily two ways. First, the facilities portion of the program provides and maintains a production base that private industry is unwilling or unable to provide. It ensures that Air Force owned industrial capability provided to defense contractors in support of Air Force and DOD acquisition programs continues to be available, and it provides additional capability when contractor investment in new plant or equipment cannot be obtained.

The Air Force currently owns industrial facilities consisting of 19 factories such as Plant 4, Fort Worth, TX (production site of the F-16 aircraft), and Plant 42 (production site of the TR-1, SR-71, B-1, and NASA's Space Shuttle), as well as over one million items of plant equipment ranging from small grinders to 50,000 ton forging presses, the largest in the U.S. As the "landlord" for these properties, the Industrial Facilities program provides for their maintenance, rehabilitation, and any necessary expansion, as well as efforts necessary for compliance with federal and state environmental protection and energy conservation requirements.

For approximately twenty years the Air Force has followed the policy, mandated by Congress, of reducing, where possible, the government ownership of aircraft production and overhaul property in the custody of its contractors. This property, acquired generally during WW II and the Korean conflict, has an acquisition cost in excess of 4 billion dollars. While this property is needed to produce Department of Defense products, there is no reason why the government should retain title to the property. With the General Services Administration acting as our agent, we have been able to negotiate the sale of entire Air Force plants, as well as plant equipment and support property, to contractors having possession of these properties. A negotiated sale to the using contractor ensures the preservation of the previously established defense base. Since 1958, the Air Force has reduced its inventory of industrial plants from 104 to its present level of 19 and reduced the number of contractors being furnished production equipment from over 500 to less than 200. Of our remaining 19 plants, 11 are currently in the negotiated sale process.

The second major aspect of the Industrial Facilities program is the Manufacturing Technology (MANTECH) program. The primary objective of MANTECH is to ensure that the defense industrial base is capable of producing cost effective Air Force weapon systems. This is accomplished by the investment of MANTECH "seed" money with industry for the purpose of reducing both the technical and economic risks associated with implementing advanced manufacturing methods.

The result is the transition of significantly advanced manufacturing technology from the laboratory to the factory floor in time to impact the costs and reliability of our weapon systems.

MANTECH provides improved fabrication methods, improved equipment and material utilizaion, alternatives to critical and strategic materials, and reductions in direct labor and labor associated overhead costs. The program also includes the Technology Modernization business strategy, a new initiative started in fiscal year 1981, which couples contractual tools designed to increase contractor capital investment with manufacturing state-of-the-art advancements, so that maximum productivity enhancement can be achieved. MANTECH advancements are also provided to our Air Logistics Centers (ALCs) in order to reduce the operating costs of our weapon systems.

The Technology Modernization business strategy consists of three basic phases: Phase I is a top-down look at manufacturing systems and processes in a factory producing or planning to produce a weapon system. Phase I establishes a factory plan that identifies overall manufacturing requirements. Phase II consists of more detailed factory plans including capitalization needs and the continuation and expansion of specific enabling technologies (MANTECH method projects). Phase III will complete the technology programs, capital equipment definition, and related activities leading to full production implementation.

We have had significant successes with the MANTECH program. One particularly successful project was derived from our Integrated Computer Aided Manufacturing (ICAM) work. The objectives of the project were to apply robotics to the drilling and routing of sheet metal panels, to establish software and control systems which enhance programming and versatility, and to make robots more adaptable to aerospace production situations. The Air Force invested 652,000 dollars in contracts with the General Dynamics Corporation for this effort, which was completed during March 1980.

The expected benefits to be achieved by this project included increased productivity, improved quality, and reduction of reject rates. Expected benefits were achieved with a productivity increase of 400 percent and a reject rate reduction from 10 percent to 0. General Dynamics has and will continue to expand this robotic technology to other production opportunities in their manufacturing facilities. Other aerospace, commercial, and machine tool and equipment builders are integrating this technology in their developments. The savings in the first year for this application have been calculated at 100,000 dollars. These savings will increase manyfold as the application of robotics in the aerospace industry increases.

In order to further the objective of widespread disemmination and implementation of MANTECH results, several initiatives, in addition to the Technical Modernization business strategy, have been developed. For example, technology licensing and For Early Domestic Dissemination (FEDD) clauses are included in MANTECH contracts. The FEDD clause allows early release of manufacturing technology results to domestic users while protecting against the export or release of this technology to foreign competitors. Licensing agreements provide the opportunity for other contractors to implement new manufacturing technology advances.

Several modifications are also being made in weapon system source selection procedures to give contractors added incentives to invest in manufacturing technology advances. The executive summary letter which is sent with the request for proposal (RFP), will alert industry to the Air Force's interest in productivity enhancement and the application of MANTECH efforts to reduce costs. Manufacturing technology enhancement will be included in the source selection criteria as an important factor. A service test of these improved source selection procedures was initiated in the recently released C-X RFP. That RFP requires the development of a MANTECH Plan which addresses methods to improve production efficiency, requires the assessment of specific manufacturing technologies and their potential for reducing C-X costs, and requires the identification of, and mechanisms for, any associated production facility modernization. These new initiatives are all designed to assure that the MANTECH program is an even more effective tool for enhancing the productivity of the defense industrial base.

VII. READINESS

Readiness is a rather broad term. It is used here to describe the ability to employ our forces effectively without unacceptable delays. It includes the hardware, the people, the training, and the type of tactics.

Some of the measurements of readiness are rather subjective and depend, for example, on the quality of the people in our force and the quality of training they actually receive. Other measurements can be quantified, such as the calculation of spares required for a weapon system. But, even here, such a calculation is dependent upon the forces authorized by Congress.

Although readiness is an important condition which must be met before an initial exchange with an enemy, it is sustainability that will win the war or provide the basis for deterrence. Sustainability calls for sufficient stockpiles to meet our needs until industry can gear up to fill depot pipelines.

Our country is committed to the concept of military readiness and has, in the recent past, established the Rapid Deployment Force (RDF). Some of our Air Force units will deploy with the RDF in time of crises. What I discuss here represents only some of their needs, additional requirements, such as bombs and bullets, are reflected in other appropriations.

This section does not represent a unique mission area. The costs associated here are included in the mission areas they support. Included are the missile and aircraft spare and repair parts, war consumables, common ground equipment, simulators, and weapons procurement.

Missile and Aircraft Spares and Repair Parts

Our missile spares and repair parts have been fully funded in the past several years. Because of this, we have continued to have high mission capable rates in the missile program. However, any reduction in funding would impede the progress being made in upgrading logistics support to the missile forces and could affect our mission capable rates.

The aircraft Spares and Repair Parts program, on the other hand, has been seriously underfunded the past few years. This program consists of two distinct elements; initial spares and replenishment spares. Initial spares are items peculiar to a weapon system being introduced for the first time and includes items required to support the procurement of new aircraft, modifications to aircraft, aircraft support equipment, and spare engines. Initial spares are programmatic, that is, if we increase or decrease our weapon system or modification program, our requirements for spares vary accordingly.

For initial spares, we can calculate what we need based on our procurement plans. However, because of fiscal constraints and lack of information on new systems, we have not fully funded initial spares in the past. Our initiatives started last year are turning this around. We are using a large share of the funds already appropriated to support spare parts, engines, and modules for the F-15/F-16 fighters, the cornerstones of our tactical forces. We are continuing this effort with our fiscal year 1982 request to include emphasis on the A-10 and TR-1 programs.

Replenishment spares are required to provide continuing support for the life of our weapon systems. In this program we procure replacement spares that are worn beyond our capability to repair and must be condemned. The program also includes increased base and depot stock levels and pipeline needs that generate from a modification to, or acquisition of, a new system.

In order to better satisfy our needs and to program limited resources, we segment our replenishment spares into two categories - Peacetime Operating Stock (POS) and wartime stock, or War Reserve Material (WRM). The POS category provides the necessary spares to support the peacetime flying hour program. Because of the long lead time on many of the replenishment spares, we program funds two years ahead of the flying hour program to be supported. The WRM category provides the additional spares required to support initial wartime deployment and to sustain wartime operations.

Our wartime capability, which is based on both POS and WRM, is not what we desire because our spares posture has been deteriorating. The reasons vary, but include fiscal constraints which in past years forced trade-offs that favored modernization over readiness. Even though we are trying to modernize, we still have an aging force (average 14 years at the end of fiscal year 1981) that requires more spares. Inflation is another major factor in the growth of our requirements. Also, we are experiencing an increase in procurement leadtimes which forces us to buy additional assets in order to keep our supply pipeline flowing at an acceptable rate. Finally, the complexity of our systems and associated spares has increased to meet the threat posed by the Soviets. This translates directly into cost escalations which we must fund.

The Aircraft Spares and Repair Parts portion of this year's Air Force budget is the major pacing factor in the overall readiness and sustainability posture of our air forces. One measure of combat capability (or readiness) we use is Mission Capability (MC) rates. MC rates are, in large part, tied directly to our ability to properly fund, procure and stock necessary spares and repair parts. For tactical air forces, our MC rate as of 1980 averaged 62 percent. Our analytical techniques indicate that the amended fiscal year 1982 increase in the dollars used for procurement of spares and repair parts should yield an increase in our MC rate, or, more aircraft available to perform their assigned mission.

Not only does a lack of adequate funding for spares adversely affect our aircraft availability, hence combat capability, but, we also pay for it in other ways as we attempt to compensate by moving limited spares and parts through our depot maintenance facilities and distribution system faster - thereby paying higher transportation costs, overtime, etc. Also, in an attempt to provide our aircrews ready aircraft for their missions, our young mechanics and specialists are forced to cannibalize necessary parts from one aircraft to put on another; an exercise which doubles the time they would normally spend in installing a particular part or component. Finally, without adequate spares or parts, we are forced to use assets from war reserve stocks to meet peacetime training requirements. As a consequence, our sustained warfighting capabilities are seriously limited by inadequate war reserve spares.

Last year's budget request marked a major reorientation by the Air Force in shifting our limited dollars from aircraft procurement to an emphasis on sustaining our systems and improving our readiness. Our fiscal year 1982 request continues to emphasize achieving the full combat potential of our weapon systems by providing a sustaining capability.

War Consumables

The War Consumables program provides such things as external fuel tanks, bomb racks, adapters and pylons. They are procured as replacement for those items jettisoned from aircraft under wartime conditions. Since these items are only consumed under wartime conditions, there is no continuous buy after the wartime stockage objective is attained; however, any change in the projected expenditure per sortie factor could increase our stockage requirement and therefore create a new buy requirement. Currently we are supporting requirements for the F-16, HH-53 helicopter, and the Maverick missile.

Aircraft Common Ground Equipment

The Common Ground Equipment program is a key factor in the overall readiness and sustainability posture of our air forces. The Common Ground Equipment program provides those items necessary to maintain, service, and test aircraft and their components. These items are used throughout the Air Force logistics complex-on the flight line, in base maintenance shops, and at the centralized maintenance activities.

The equipmment that we are planning to procure includes such items as noise suppressors, generators, jet engine test stands, air conditioners, and munitions handling equipment. Approximately 50 percent of our request provides equipment for new aircraft entering the inventory. The remaining portion of the budget is for replacement of equipment in use (in most cases the same equipment as needed for initial equipage), requirements as a result of aircraft modifications, and WRM build-up. The equipment replacement program is a continuing effort to keep pace with technology and provide support to our current weapon systems. The WRM build-up is an important item because it refers to pre-positioning of ground equipment to support the Rapid Deployment Force (RDF) objectives.

Simulators

Achieving a high state of mission readiness through improved training is the primary objective of the Air Force Flight Simulator program. The most important value we expect from modern simulator investments is to attain combat mission readiness through training in a more efficient and effective manner. However, it should be recognized that simulation is not a substitute for, but a complement to, actual "in-flight, hands-on" proficiency training.

Simulation can improve flying training efficiency by allowing students to develop specific skills by concentrating their efforts in a particular area. Flight safety is also enhanced by allowing the student to practice hazardous or restricted maneuvers which are not allowed in the aircraft. Use of simulators increases aircrew performance in an actual weapon system. This is accomplished by exposure to a real threat environment and an ability to practice actual combat tactics--some of which are prohibited in peacetime.

Effectiveness in actual combat will depend heavily on aircrew performance. This performance will reflect how well an instructional system exposed the crewmember to actual planned tactics in a combat environment. Peacetime flying restrictions limit this exposure in quality as well as quantity.

With the right combination of flight simulators and aircraft we intend to:

Maintain and improve the combat readiness of experienced aircrews.

Provide effective initial training for student pilots and aircrew members.

Reduce training and operating costs.

Conserve scarce resources such as energy, weapons, and ammunition.

We have some simulators now in the field, including those for the F-15, A-10, E-3, T-37, and T-38. These have varying degrees of capability. We are now procuring simulators for the B-52 and the F-16. In future years we will be procuring simulators for the EF-111 and the KC-135. I'll expand briefly on the B-52 and the F-16 simulators.

SAC requires ground based instructional systems to serve as primary training vehicles to support initial aircrew qualification, mission qualification, and continuation training for the B-52 aircraft weapon system. The current analog training devices in use are obsolete, inefficient and are increasingly difficult to operate and maintain. Further, many training objectives cannot now be satisfied by either the aircraft or the existing training devices. Recent restrictions on flying hours and mandated reductions in energy consumption require the procurement of new simulators to train B-52 aircrews to accomplish their primary mission, i.e., to perform in combat. The B-52 Weapon System Trainers (WSTs) and the Offensive Station Mission Trainer (OSMT) will provide most of that required training capability.

The equipment simulates all crew positions and on-board equipment and will provide realistic training for B-52 crew members. The flight station (pilot and co-pilot), offensive station (radar navigator and navigator) and defensive station (electronics warfare officer and fire control operator) will be capable of integrated as well as independent operation. The simulator includes a visual system and a motion system to provide visual and motion cues, as appropriate. Other major items simulated include the Radar, Offensive Avionics Station/Cruise Missile Integration, Forward Looking Infrared Radar (FLIR), and Low Light Level Television (LLLTV). The Digital Radar Landmass System will provide the capability to "fly" anywhere in the world and in conjunction with simulating electronic threats, will provide a realistic combat rehearsal scenario.

With these devices, aircrews may be trained in essentially the entire spectrum of tasks that each will be expected to perform in both peacetime and wartime environments. Additionally, the B-52 simulator will provide an improved operational capability for continual assessment of the weapon system to satisfy Emergency War Order (EWO) objectives. These areas involve defense analysis, tactics development, and employment concepts.

The F-16 Operational Flight Trainer (OFT) consists of a single cockpit replica of the aircraft, an instructor operator station, and the required computers and peripheral equipment necessary to operate and support the trainer operation. The basic OFT will provide training in normal and emergency system operation, limited weapons delivery, and radar target acquisition and attack. Also, the student may be taken through programmed demonstrations to illustrate proper procedures and maneuvers, as well as a playback capability to show students how their techniques can be improved for the tactical air role.

F-16 training capability will be enhanced by the addition of electronic warfare and digital radar landmass simulations by late 1984. Incorporation of these features will provide for both the full range of radar threats likely to be encountered in the F-16 and improved air-to-surface radar simulation for air-to-ground weapons delivery and radar navigation.

Weapons Procurement

In fiscal year 1982, the Air Force is requesting 3.0 million dollars to procure 429 machine guns and grenade launchers to enhance our airbase defense capability. This category, which is included in this year's "Other Procurement" request, requires authorization. These weapons will provide armament for the increased base defense units being formed and will increase the capability of existing base defense units. Of the 429 weapons, the majority are M-203 40mm grenade launchers (189) or Mk-19 40mm grenade machine guns (177). These two weapons provide grenade launching capability for our security police when defending our overseas bases. The M-203 is used with the M-16 rifle to provide individual grenade launching ability. The Mk-19 provides support to the whole unit by rapidly launching up to 500 grenades per minute. The last item being requested is the M-60 machine gun (63), which provides sustained small arms fire capability for airbase defense units. The M-203 was last procured by the Air Force in fiscal year 1977, the M-60 in fiscal year 1970, and this will be the first procurement of the Mk-19 for the Air Force.

VIII. AIR FORCE PROGRAM MANAGEMENT

The Air Force is continually striving to improve the methods we employ to manage our programs. Our quest for greater efficiency is driven by the rapidly growing capabilities of the Soviet military forces, the erosion taking place in the purchasing power of our defense dollars, and the deteriorating capability of our defense industrial base.

The Air Force has undertaken several management initiatives in technology planning and acquisition management. These initiatives are not limited to procurement programs solely. Rather, they include those which apply to the full spectrum of system acquisition, including RDT&E.

TECHNOLOGY PLANNING

The Air Force is constantly striving to improve the efficiency of its technology and development programs. To accomplish this, we are continuing the Vanguard planning system, as well as working with our NATO allies to get the most out of the dollars we spend.

Vanguard System. The Vanguard planning and control system is a continuing initiative to improve the efficiency of technology and development programs. Vanguard planners integrate threat information, scenario data, and mission area objectives to prepare a master plan for research and development needs and programs. Mission area planners then define and prioritize individual programs to satisfy this master plan. Implemented by the Air Force Systems Command, the Vanguard system provides a comprehensive roadmap of the planned contributions and interrelationships of all Air Force development and procurement programs. This information assists program managers in planning technological efforts and communicating their needs to all levels of command, as well as assisting the Air Force in preparing responsive research and development programs to satisfy our mission goals.

NATO. The Air Force and other members of the Department of Defense are continuing a number of initiatives to increase defense equipment standardization and interoperability within NATO. These initiatives include the family of weapons concept, establishment of dual production capabilities, and development of reciprocal purchasing memoranda of understanding. Our objectives are to increase combat effectiveness, strengthen the overall military and industrial capability of the Alliance, reduce unnecessary duplication of programs, and to conserve our vital defense resources.

Through the family of weapons concept, Alliance requirements are harmonized for discreet mission areas. When complementary systems are found to be compatible from both a requirements and timing standpoint, shared development programs may be undertaken. The recently signed memorandum of understanding for advanced air-to-air missile systems is the first use of this concept. The U.S. will develop and produce the Advanced Medium Range Air-to-Air Missile

(AMRAAM) and Germany and the United Kingdom will jointly develop and produce the Advanced Short Range Air-to-Air Missile. Each side will be able to eventually produce the other's missile. This joint project will save the U.S. the cost of developing the next generation short range air-to-air missile system.

The establishment of dual production capabilities for the same weapon system on both sides of the Atlantic is accomplished through license arrangements. This provides for standardization and savings of funds that would have otherwise been spent to develop similar systems. The ongoing coproduction of the F-16 multinational fighter is a classic example of the successful employment of this approach.

The third initiative involves the reciprocal purchasing memoranda of understanding for defense equipment. In support of this initiative, the Air Force has fostered understanding of our acquisition process through sponsored visits by foreign industries to our Systems and Logistics Commands. In addition, we have a European Workload Program with the objective of increasing our readiness in Europe by placing some maintenance and overhaul capability there. To further enhance Alliance standardization, the Air Force budget includes funds to support our work with our allies on the NATO Airborne Warning and Control System, the Navstar Global Positioning System, the purchase from the United Kingdom of the Rapier missile for point air defense of our air bases there, the cooperative development with Germany of the Locust Harassment Drone, and the reengining of the KC-135 with the U.S.-French developed CFM-56 engine.

ACQUISITION MANAGEMENT

The Air Force has a number of ongoing acquisition initiatives to ensure that the money provided by Congress is spent wisely. These initiatives are in the areas of acquisition policy, contracting actions, and program management.

Acquisition Policy. The overall Air Force policy governing major acquisition programs has been updated to reflect growing concerns for energy conservation and weapon system supportability. The need to promote energy conservation through acquisition decisions is reflected in Air Force regulations and instructions guiding the implementation of acquisition programs. Starting with the Statement of Need through all phases of the program, program managers and all echelons of review are required to consider energy efficiency in making acquisition decisions. The KC-135 Reengining program, B-52 Companion Trainer Aircraft program, and our aircraft simulator programs included in the Air Force budget support our concerns for reducing future energy needs.

Our acquisition policy has also been updated to reflect a new emphasis on weapon system supportability. In recognition of the significant portion of weapon system costs allocated for operation and maintenance, supportability considerations are now included early in the design process along with system performance, cost, and schedule requirements. Through the early consideration of supportability requirements, we expect to achieve greater visibility into weapon system life cycle costs and the impact of various design alternatives on those costs.

Contracting Actions. The Air Force has several ongoing contracting actions to deal with the eroding purchasing power of our defense dollars. These actions include refining contracting methods, emphasizing competition, requiring industry to take greater responsibility for the quality of their products during the operational phase, and integrating "buy commercial" policies into the acquisition process.

We are continuing to refine our contracting methods to do business more like our industrial counterparts. We will use, where appropriate, firm fixed priced contracts and fixed price incentive (FPI) contracts with tightened share ratios. These contracting methods are generally used on mature production programs and some research and development level-of-effort studies and competitive prototype programs. In addition to the stabilizing force these methods have on defense contractors, they also provide incentives to contractors to increase profit through improved internal operations and sharing in more of the program risk with us.

The Air Force will continue its commitment to increase competition by reducing sole source contract awards. Through our acquistion policies and reviews by a Business Strategy Panel, competitive acquisition strategies are encouraged. Through competition, we are seeking more innovative solutions to our defense problems, higher quality products, and fair prices for those goods and services we buy. Generally, once a program reaches the production phase, a sole source production contract is let. However, on some programs where the production quantities are large, a second sourcing technique can be used to maintain competition during the production phase. Included in the Air Force budget are funds to develop a second source for the Imaging Infrared Maverick program.

An area of continuing contracting interest is in contractor responsibility for quality, reliability, maintainability, and availability after items are accepted and in Air Force use. As an example of Air Force activities in these areas, we are refining our procedures on the use of warranties. We have worked out guidelines with industry on the proper application of warranties and have begun applying warranties to many products. The fix without charge provisions of these warranties encourages contractors to design better products and correct deficiencies before systems enter operational use. Included in the Air Force budget are funds to provide warranties on the Air Launched Cruise Missile program and the TF34 and F100 engine programs.

The Air Force supports the policy of integrating "buy commercial" policies into its acquisition process. Aspects of this policy are reflected in the acquistion strategies and support concepts of the KC-10A Advanced Tanker Cargo Aircraft (ATCA) and the B-52 Companion Trainer Aircraft programs. The Air Force is also continuing its efforts to review available commercial items for direct acquisition without developing detailed military requirements for similar items. These efforts will assist us in striving to reduce our development and life cycle costs.

Program Management. The Air Force is actively pursuing, with other Department of Defense agencies and defense contractors, management alternatives for dealing with the economic factors that are adversely affecting our acquisition process. Our efforts are directed at reducing unit cost through economical quantity buys, encouraging capital investment in more modern and efficient machines and tools, and increasing productivity.

The Air Force is supporting initiatives to reduce weapon system unit costs through more economical acquisition practices. Presently, procurement quantities are authorized and the funds appropriated by Congress on an annual basis. This leads to annual contracts which generally allow contractors to purchase only materials, parts, and production capacity for the quantity approved. In the economic environment of the 1970s, inflationary pressures have forced unit prices up. To stem this trend, we support using, on appropriate programs, multiyear procurements and an incremental funding approach.

Multiyear contracts are currently an approved technique. They involve a more definitive commitment by the Government to longer term programs by offering contractors protection against losses from unrecovered nonrecurring costs. However, P.L. 93-155, Section 810, prohibits a cancellation ceiling in excess of 5 million dollars without separate advance statutory approval. As a practical matter, the time required to obtain such a statute renders multiyear contracting impractical for many major systems acquisitions. We support initiatives to eliminate the cancellation ceiling or, as a less preferred alternative, to substantially increase the cancellation ceiling limitation. The Air Force is currently evaluating the use of a multiyear contracting strategy for the F-16, Air Launched Cruise Missile (ALCM), Global Positioning System (GPS) satellites, and the Low Level Laser Guided Bomb (LLLGB).

We are also working with the Office of the Secretary of Defense (OSD) to find ways to permit contractors to purchase outyear quantities of materials and components when doing so will yield significant savings. Two methods of funding to achieve economies of scale are under consideration. The first would permit, as an exception to the DOD full funding policy, the advance procurement of materials for outyear requirements for reasons of economic savings. Currently, advance procurement is permitted only for long lead items and not for economic reasons. The second and preferred method would allow contractors to purchase economic lots of materials and components for outyear requirements and include those recurring costs in the cancellation ceiling. Currently, only nonrecurring costs (that is, start-up costs) may be included. We will continue to work with OSD and the Congress to process the necessary changes to the statutes and DOD directives.

Incremental funding is another approach to reduce unit costs through authorizing economical quantities at the start of the program. This approach is specifically being requested for use on the Defense Support program (DSP) satellite production and being considered for TR-1 aircraft production programs. It requires authorizing the firm quantity of production DSP satellites and TR-1 aircraft at the start of the programs and incrementally funding the programs (rather than fully funding complete end items in a series of separate annual buys). We anticipate that significant savings will result if this approach is approved.

The Air Force is continuing to seek ways to encourage defense contractors to invest in modern production facilities and equipment. For many years, the U.S. has invested heavily in technological innovation, new manufacturing processes, and increased productivity. The benefits of our investments, however, have not been equally applied within the defense industry. Many of our defense industries are still using facilities and equipment over 20 years old. This situation has been developing over many years from the influences of tough economic conditions, inflationary erosion of profits, and existing laws and regulations covering taxes and depreciation. Our initiatives to use multiyear contracts on major weapon system acquisitions, to provide termination protection for certain contractor investments in capital equipment, and to negotiate higher contract profits, where appropriate, will assist greatly in resolving some of the disincentives our defense contractors face in investing in new facilities and equipment.

We are also striving to refine our policies and procedures which adversely impact contractors' profits. Inflation and high interest rates have discouraged or prevented contractors from borrowing funds. DOD contracts, interest expenses are not an allowable cost. We have been working with defense contractors to understand the impact our policies and procedures are having on their profits. Our initiative to date centers on the contractors' need for cash for contract performance. Early payment for work performed assists in reducing the erosion of contractors' profits due to the high cost of money. In those cases where a contractor documents needs for earlier compensation for incurred costs, we consider and use milestone billings to reduce the contractor's need to borrow money for contract performance.

The Air Force supports the ongoing Congressional actions being taken to revamp current national laws which adversely impact capital investment. The revamped Capital Cost Recovery Act of 1979 will be a positive step forward in encouraging capital investment by divorcing capital recovery from the useful or physical life concepts and by providing depreciation alternatives which allow faster capital recovery.

Productivity is a measure of the overall health of our defense contractors, and it impacts their ability to respond to our continuing and wartime surge requirements. Over the past several years, the productivity has declined along with investments for research and development, industrial facilities, and equipment. Other factors which affect productivity are manufacturing technology and availability of critical materials.

The Air Force initiatives discussed under economical quantity buys and capital investments will help reverse the trend of declining productivity in our defense industries by encouraging investment in new facilities and equipment. The Air Force Industrial Facilities Program will continue to augment defense industry contractors' capabilities, where necessary. Included in the Air Force budget are production funds to maintain the facilities and equipment included in the Industrial Facilities Program.

The Manufacturing Technology (MANTECH) program, described earlier, has successfully demonstrated an ability to improve industrial productivity, reduce dependency on critical materials and foreign sources, provide new manufacturing capability, and reduce hardware costs.

The Air Force is working with other DOD agencies and defense contractors to reduce our growing dependence on foreign sources of raw materials and fuels used in the production of defense systems. As we apply advanced technologies to our new weapon systems, the list of materials and fuels required to produce these systems expands. Materials such as columbium, titanium, beryllium, manganese, tantalum, chromium, nickel, tungsten, and aluminum are being widely applied in system designs to gain additional performance and withstand higher operating temperatures. Many of these metals are only available from foreign sources.

We have several initiatives to reduce our dependence on critical materials and fuels. Our Rapid Solidification Technology program will help us reduce critical materials required to produce high technology components. Our Materials Research program is searching for alternate solutions which do not require or will reduce the need for critical materials. In addition, our Aviation Turbine Fuel Technology program is evaluating the impact of liquid fuels obtained from sources such as oil shale, tar sands, and coal--all readily available within the U.S.

IX. CONCLUSION

Mr. Chairman, this concludes my statement on the Air Force Aircraft and Missile procurement budget request. We have considered the Soviet threat and the possibility of the need to project our forces to remote areas. Our request is the result of detailed and careful deliberation, but the reality of fiscal limitations has denied us the opportunity to satisfy all of our needs. Our emphasis has been on those programs that will improve our operational readiness and sustainability. However, we have made a determined effort to appropriately prioritize our needs within the constraints imposed on us. In addition, we are continuing efforts to improve our management while working with the other services and our allies to produce weapons that can be supported in the field.

In summary, I believe this request represents a procurement level essential to support and modernize our strategic and conventional forces--forces in which we may have to place great reliance to ensure our continued security in the uncertain and uneasy decade which confronts us. If you have questions, I will be happy to answer them at this time.

TABLE I
DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 AIRCRAFT PROCUREMENT ESTIMATES
(In Millions of Dollars)

	QTY	FY 82 ESTIMATES
COMBAT AIRCRAFT		
Long Range Combat Aircraft		$ 1,942.0
A-10 Attack Aircraft	60	542.4
F-5F Tactical Fighter	3	23.0
F-15 Tactical Fighter	42	1,227.2
F-16 Tactical Fighter	120	1,656.9
KC-10A Advanced Tanker/Cargo Aircraft	8	437.0
MC-130H Special Operations		33.3
E-3A Airborne Warning and Control System	2	270.0
	235	6,131.8
TRAINER AIRCRAFT		
B-52 Companion Trainer		3.9
OTHER AIRCRAFT		
UH-60A Helicopter	12	63.0
TR-1	6	113.7
	18	176.7
MODIFICATION OF IN-SERVICE AIRCRAFT		2,132.1
AIRCRAFT SPARES & REPAIR PARTS		4,266.1
AIRCRAFT SUPPORT EQUIPMENT & FACILITIES		
Common Ground Equipment		405.2
Industrial Facilities		93.4
War Consumables		83.9
Other Production Charges		1,100.6
NATO Airborne Early Warning and Control		358.2
		2,041.3
AIRCRAFT PROCUREMENT, AIR FORCE		$ 14,751.9

Note: Totals may not add due to rounding.

TABLE II
DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 MISSILE PROCUREMENT ESTIMATES
(In Millions of Dollars)

	QTY	FY 82 ESTIMATES
BALLISTIC MISSILES		
Minuteman II/III		$ 34.3
ICBM C^3 Integration		56.1
		90.5
OTHER MISSILES		
ALCM	440	589.9
GLCM	54	329.2
AIM-7F/M Sparrow	1,560	227.0
AIM-9L/M Sidewinder	1,800	132.5
AGM-65D Maverick (IIR)	490	232.3
AGM-88A HARM	136	89.1
Rapier		133.0
Aerial Targets		17.2
	4,480	1,750.2
MODIFICATION OF IN-SERVICE MISSILES		139.7
SPARES & REPAIR PARTS		203.5
OTHER SUPPORT		
Space Programs		891.2
Industrial Facilities		15.6
Special Programs		1,567.6
		2,474.4
MISSILE PROCUREMENT, AIR FORCE		$4,658.2

Note: Totals may not add due to rounding.

GLOSSARY

AAA	Anti-Aircraft Artillery
AABNCP	Advanced Airborne Command Post
AEW&C	Airborne Early Warning and Control
AFB	Air Force Base
AFSATCOM	Air Force Satellite Communications System
AGM	Air-to-Ground Missile
AIM	Air Intercept Missile
ALC	Air Logistic Center
ALCC	Airborne Launch Control Center
ALCM	Air Launched Cruise Missile
ALCS	Airborne Launch Control System
AMRAAM	Advanced Medium Range Air-to-Air Missile
ARM	Anti-Radiation Missile
ASPJ	Airborne Self-Protection Jammer
ATCA	Advanced Tanker Cargo Aircraft
AWACS	Airborne Warning and Control System
BMEWS	Ballistic Missile Early Warning System
C^3	Command, Control, and Communications
C^3CM	Command, Control, and Communications Countermeasures
CCM	Counter-Countermeasures
COMSEC	Communications Security
CONUS	Continental United States
CRAF	Civil Reserve Air Fleet
DCS	Defense Communications System
DMSP	Defense Meteorological Satellite Program
DOD	Department of Defense
DSCS	Defense Satellite Communications System
DSP	Defense Support Program
EAM	Emergency Action Message
ECCM	Electronic Counter-Countermeasures
ECM	Electronic Countermeasures
EW	Electronic Warfare
EWO	Emergency War Order
FEDD	For Early Domestic Dissemination
FLIR	Forward Looking Infrared
FLTSATCOM	Fleet Satellite Communications
FPI	Fixed Price Incentive
GLCM	Ground Launched Cruise Missile
GPS	Global Positioning System
HARM	High Speed Anti-Radiation Missile
HF	High Frequency
HUD	Heads-Up Display
ICAM	Integrated Computer-Aided Manufacturing
ICBM	Intercontinental Ballistic Missile
IIR	Imaging Infrared
IOC	Initial Operational Capability
IR	Infrared
IUS	Inertial Upper Stage
LANTIRN	Low Altitude Navigation and Targeting Infrared System for Night
LLLTV	Low Light Level Television
LRCA	Long Range Combat Aircraft
MANTECH	Manufacturing Technology
MC	Mission Capability
MPS	Multiple Protective Shelters
MRASM	Medium Range Air-to-Surface Missile
M-X	Missile X

NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCA	National Command Authorities
OAS	Offensive Avionics System
OFT	Operational Flight Trainer
OSD	Office of the Secretary of Defense
OSMT	Offensive Station Mission Trainer
OT&E	Operational Test and Evaluation
PAM-D	Payload Assist Modules-Delta Class
PLSS	Precision Location Strike System
POS	Peacetime Operating Stocks
RAF	Royal Air Force
R&D	Research and Development
RDF	Rapid Deployment Force
RDT&E	Research, Development, Test, and Evaluation
RFP	Request for Proposal
RSI	Rationalization, Standardization, and Interoperability
RV	Reentry Vehicle
SAC	Strategic Air Command
SALT	Strategic Arms Limitation Talks
SAM	Surface-to-Air Missile
SCT	Single Channel Transponder
SDS	Satellite Data System
SHF	Super High Frequency
SIOP	Single Integrated Operational Plan
SLAR	Side Looking Airborne Radar
SLBM	Submarine-Launched Ballistic Missile
SRAM	Short Range Attack Missile
SSS	Strategic Satellite System
STC	Satellite Test Center
TEREC	Tactical Electronic Reconnaissance
TIPI	Tactical Information Processing and Interpretation
UHF	Ultra-High Frequency
UK	United Kingdom
U.S.	United States
USAF	United States Air Force
USAFE	United States Air Force Europe
VHF	Very High Frequency
WAAM	Wide Area Antiarmor Munitions
WRM	War Reserve Material
WST	Weapon System Trainer
WWMCCS	Worldwide Military Command and Control System

OTHER PROCUREMENT

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE: I am pleased to appear before you today to present and justify the Other Procurement, Air Force Budget Request for Fiscal Year 1982. The Other Procurement budget is divided into four major budget activities--Munitions and Associated Equipment, Vehicular Equipment, Electronics and Telecommunications Equipment, and Other Base Maintenance and Support Equipment. As indicated by these titles, this appropriation is a diverse amalgam of essential logistics support items. The Other Procurement Budget is further subdivided into 272 separate P-1 line items of equipment. The quantities of each piece of equipment have been determined through statistical replacement requirements, as a support element of larger overall defense programs, or a combination of the two methods. Of the 272 P-1 lines, 255 are requests for continuation of programs while 17 are new items not previously procured by the Air Force. The Other Procurement programs fund primarily replacement equipment, additional war reserve material, peacetime training support, and systems modernization. With the exception of three small weapons procurements, none of these items require Congressional authorization. The three weapons are contained in the Other Weapons category of the Munitions and Associated Equipment budget activity.

To begin, I will provide the Committee a comparison, by budget activity, of the FY 1982 budget request and the amended FY 1981 program. Then I will review each budget activity and explain what is needed and why.

TABLE I

DEPARTMENT OF THE AIR FORCE
FISCAL YEAR 1982 BUDGET
OTHER PROCUREMENT APPROPRIATION
(MILLIONS OF DOLLARS)

BUDGET ACTIVITY	FY 1981	FY 1982	Change 81-82
Munitions & Associated Equipment	344.4	1123.7	+ 779.3
(War Reserve Materiel)	(174.2)	(783.9)	(+ 609.7)
Vehicular Equipment	158.1	340.1	+ 182.0
Electronics & Telecommunications	699.9	1126.7	+ 426.8
Other Base Maintenance & Support Equipment	1,939.7	2,605.6	+ 665.9
TOTAL	3,142.1	5,196.2*	+2,054.1*

* Totals do not add due to rounding.

This table shows the changes between the FY 1981 program and FY 1982 request by activity. Although the FY 1982 request is $2,054.1 million greater than FY 1981, it should be noted $480.6 million or 23 percent of the increase is for classified programs. A rigorous examination of a multitude of competing programs was conducted with priority emphasis on readiness and sustainability, modernization and day-to-day mission needs. We believe the FY 1982 Other Procurement budget request demonstrates a well-proportioned application of resources needed to support the current and budgeted force structure. We will now review the first budget activity Munitions & Associated Equipment.

TABLE II

BUDGET ACTIVITY I
MUNITIONS & ASSOCIATED EQUIPMENT
(MILLIONS OF DOLLARS)

CATEGORY	FY 1981	FY 1982	Change 81-82
Rockets & Launchers	0.4	0.1	- 0.3
Cartridges	157.8	502.1	+ 344.3
Bombs	117.1	461.4	+ 344.3
Targets	11.2	13.0	+ 1.8
Other Items	44.1	92.9	+ 48.8
Fuzes	13.8	51.2	+ 37.4
Other Weapons	0	3.0	+ 3.0
TOTAL	344.4	1,123.7	+ 779.3

The Munitions and Associated Equipment Budget Activity provides for the procurement and modification of conventional munitions (excluding missiles) and associated equipment, firearms, armament training devices, and spare and repair parts. Funds requested will procure munitions needed to sustain peacetime operations and increase War Reserve Materiel (WRM) stockpiles. With the initiative started in the 1981 budget to redress the aircraft spares shortfalls, WRM munitions stocks will become the major readiness shortfall within the Air Force. WRM munitions stockpiles have not been substantially modernized since the end of the Vietnam era large procurements. As a result, the majority of our conventional munitions stockpiles are over ten years old. These stocks have been slowly depleted over the ten year interval by sampling tests, condemnations, and training consumption. As a result, we have a dwindling stock of older, less effective munitions; augmented by small buys of the newly developed munitions. The projected stockpile that has evolved does not meet the projected requirements for the near term. To offset this shortcoming, an increase in production of available modern munitions has been initiated in this budget request. We anticipate continuing substantial procurements in future years to reverse the trends of an old stockpile being used to counter a modern threat. Peacetime requirements are based upon training allowance documents and Command projected requirements, while WRM requirements are computed based on planning scenarios contained in guidance from the Secretary of Defense. The FY 1982 request of $1123.7 million is $779.3 million more than FY 1981 and is consistent with overall Air Force funding priorities. Approximately 70 percent of the budgeted funds is for WRM stocks with the remainder for: training munitions (28 percent), targets (1 percent), other (1 percent). This year funds are requested for three firearms, the only items within the OPAF Appropriation which require authorization. Historically, for presentation purposes, the individual budget lines in this activity are grouped into seven major categories: Rockets and Launchers, Cartridges, Bombs, Targets, Other Items, Fuzes, and Other Weapons. A summary of each follows:

ROCKETS AND LAUNCHERS

This year we only require $0.1 million for Rockets and Launchers. Practice rockets and miscellaneous rocket components with an acquisition value of less than $900,000 will be procured to support peacetime requirements. The Air Force's reduced requirement for meteorological probes accounts for the continued reduced funding request in FY 1982.

CARTRIDGES

The cartridges category totals $502.1 million or 45 percent of the entire FY 1982 Munitions Budget Request. The majority of these funds ($369.8 million) is for continued procurement of 30mm GAU-8, Training, High Explosive Incendiary (HEI), and Armor Piercing Incendiary (API) ammunition. The other significant items in this category are 20mm training ammunition for which $59.2 million and MXU-4A/A engine starter cartridges for which $10.9 million is needed to support peacetime expenditures and maintain required operating levels. Other items included in the FY 1982 request are: Impulse cartridges used to support day-to-day aircraft operations, caliber .38 and 5.56mm ammunition used by our base defense personnel, and $7.9 million of various minor procurements with individual acquisition values below $900,000.

BOMBS

In the bomb category we are requesting $461.4 million. Principal procurements requested are $87.6 million for laser guided bomb kits, $67.7 million for the GBU-15 Modular Guided Glide Bomb, $92.0 million for Rockeye anti-armor munitions, $39.0 million tooling and long lead items for the Low Level Laser Guided Bomb, $55.4 million for the BSU-49 and $13.5 million for the BSU-50 air inflatable retarders. Additionally, BDU-33 and MK-82 practice bomb requirements have increased over FY 1981.

TARGETS

We are requesting $13.0 million for an aerial tow target system used by tactical fighter and interceptor aircrews to develop and maintain air-to-air gunnery skills.

OTHER ITEMS

We require $92.9 million for the Other Items category. These funds are needed to procure countermeasure chaff and flares, spares and repair parts, modifications and numerous small cost items. The largest individual programs in this category are the M206, $36.6 million, and the MJU-7, $11.7 million, infrared countermeasure flares used on the A-7/A-10 and F-4/F-16 aircraft, respectively. Also included is a request for $9.6 million to procure items valued at $900,000 or less.

FUZES

Our fuze request for $51.2 million includes FMU-112 fuzes for retarded bomb applications and Mk-339 mechanical time fuzes to enhance the operational effectiveness and utility of existing cluster bomb inventories.

OTHER WEAPONS

We are requesting a total of $3.0 million for 429 grenade launchers and machine guns. These items require authorization. They are being procured to equip our base security elements stationed at overseas bases or designated to deploy to those bases in wartime. The increased number of base defense elements is being formed from already authorized manpower positions. These elements will provide close in security and perimeter defense to our rear area bases that are required to supplement the US Army/host nation area defense efforts.

I will now discuss Vehicular Equipment.

TABLE III
BUDGET ACTIVITY II
VEHICULAR EQUIPMENT
(MILLIONS OF DOLLARS)

CATEGORY	FY 1981	FY 1982	Change 81-82
Passenger Carrying	6.6	19.2	+ 12.6
Cargo and Utility	60.7	103.4	+ 42.7
Special Purpose	38.5	111.5	+ 73.0
Fire Fighting	4.4	14.9	+ 10.5
Materials Handling	21.7	52.7	+ 31.0
Base Maintenance	26.2	38.4	+ 12.2
TOTAL	158.1	340.1	+ 182.0

The Vehicular Equipment reflected above is basic to the ability of the Air Force to deploy, employ, and sustain military forces worldwide. The increased emphasis placed on vehicles in the FY82 budget recognizes the need for both quantitative and qualitative improvement of the warfighting capability of the fleet; past funding constraints have caused serious deterioration of Air Force vehicle assets. To illustrate the need, over 50 percent of current authorizations are either a shortage or vehicles that are worn out and exceed replacement criteria. Present requirements exceed $1.2 billion and a sustained effort over the Five Year Defense Program (FYDP) period is needed to solve Air Force vehicular equipment deficiencies; this budget request is part of a phased and prudent get well program. Special emphasis has been placed on direct mission support/readiness vehicles such as: aircraft towing vehicles, refuelers, 463L/materials handling equipment (aircraft loaders and forklifts), maintenance vans, and cargo/utility vehicles required for our military distribution network. These vehicles are critical to our ability to quick turn aircraft, sustain sortie surge, or load/off load munitions and strategic/tactical airlift airframes. The equipment is primary to our ability to project U.S. military power in a region, or for actual wartime operations. We are continuing our initiatives to downsize portions of our fleet to smaller vehicles where possible and purchase diesel engined equipment for selected applications to improve fuel efficiency. Additionally, we are increasing the use of multi-year procurement contracts where applicable and purchasing automatic transmissions as a policy in user driven vehicles. Economy of scale purchase savings, lower operations and maintenance life-cycle costs, and increased service life are expected to accrue. Failure to adequately fund vehicular equipment adversely affects availability to technicians and vehicle users across the Air Force; hence, combat capability of our aircraft and personnel. Vehicular transportation interfaces with and is a determinant of mission capability of any military unit; its presence has the synergistic property of multiplying productivity. The impact of the lack of this vital vehicular equipment, conversely, detracts from the efficiency, effectiveness, and capability of our military forces.

I will now discuss the six categories of vehicular equipment.

PASSENGER CARRYING

This year we are requesting $19.2 million for passenger carrying vehicles. $5.7 million of the funds requested will procure aircrew and shuttle buses from the Federal Republic of Germany, Italy, and the United Kingdom. The other $13.5 million will procure U.S. manufactured buses, ambulances, compact sedans, and station wagons. These vehicles are required to fill worldwide shortages and to replace vehicles that are worn-out and uneconomical to maintain. The equipment is a critical part of our basic transportation/ distribution network and health services.

CARGO AND UTILITY

Cargo-utility requirements total $103.4 million or 30 percent of the entire vehicular equipment request. Funds requested will procure several types of trucks including 1/2 ton and 1/4 ton pickups, cargo vehicles, maintenance vans, and dump trucks. Special emphasis was placed on M-Series military design cargo vehicles to improve our warfighting capability and distribution network.

SPECIAL PURPOSE

In this category we are requesting $111.5 million which includes aircraft tow tractors, bulldozers, telephone maintenance trucks, hi-reach maintenance trucks, and fuel tank trucks. The R-9 refueler, for $43.3 million, is the largest single item and is critically needed to enhance aircraft launch and recovery operations. Also included are five each 5,000 gallon water trucks, armored vehicles, and various minor items with an acquisition value less than $900,000.

FIRE FIGHTING

Fire fighting, for which we are requesting $14.9 million, is the smallest category. Over 25 percent of the funds in this category are for the Air Force-wide replacement of obsolete 150 pound fire extinguishers required to comply with Occupational Safety and Health Administration standards. $9.0 million is included for crash/fire trucks to equip Rapid Deployment Force (RDF) elements. The remaining funds are for P-8/P-12 structural fire trucks, P-10 crash/rescue fire trucks and P-13 fire trucks. Funds for the P-12 and P-10 trucks are in the P-1 line Items Less Than $900,000.

MATERIALS HANDLING EQUIPMENT (MHE)

Rapid onload/offload of strategic and tactical airlifted war material is imperative, therefore, adequate and reliable materials handling equipment (MHE) is one of our most critical requirements. Mobilization exercises have confirmed shortfalls in our MHE capability and highlighted the need for additional MHE to support the massive airlift of forces within the first crucial days of a military force projection. Because of the large requirements for airlift in any Southwest Asia operation, $16.0 million is requested for aircraft loaders and forklifts in Southwest Asia to support RDF deployment. Aircraft loaders, forklifts, warehouse tractors, lifting devices, and minor items with an acquisition value below $900,000 comprise the balance of the request.

BASE MAINTENANCE SUPPORT

The last category in this budget activity includes $38.4 million for various construction and grounds maintenance equipment. Scoop loaders, runway sweepers, graders, rollers, cranes and scrapers will be procured with requested funds. Equipment spares and repair parts and modifications are also included in this category. The FY 1982 funds will also procure construction vehicles for nine additional Rapid Runway Repair sets.

I will now move to the third budget activity - Electronics and Telecommunications.

TABLE IV

BUDGET ACTIVITY III
ELECTRONICS AND TELECOMMUNICATIONS
EQUIPMENT
(MILLIONS OF DOLLARS)

CATEGORY	FY 1981	FY 1982	Change 81-82
Communications Security Equipment	36.6	93.3	+ 56.7
Intelligence Programs	17.2	22.0	+ 4.8
Electronics Programs	153.6	289.1	+ 135.5
Special Communications Electronics Projects	140.3	179.6	+ 39.3
Air Force Communications	113.5	160.4	+ 46.9
Defense Communications Agency Programs	25.5	14.6	- 10.9
Organization & Base	125.2	279.1	+ 153.9
Modifications	88.0	88.5	+ .5
TOTAL	699.9	1,126.7*	+ 426.8*

* Totals do not add due to rounding.

The FY 1982 request for $1.1 billion is $426.8 million more than requested in FY 1981. The funding will enable the continued acquisition of command, control, and communications (C^3) equipment being procured with multi-year option contracts such as: Defense Support Program mobile ground terminals, the fifth and final Ground-Base Electro-Optical Deep Space Surveillance (GEODSS) System, Joint Tactical Communications Program (TRI-TAC) equipment, telephone exchanges, mobile satellite terminals, Defense Communications System (DCS) wideband systems, aircrew combat training equipment, Thule and Fylingsdale Ballistic Missile Early Warning System (BMEWS) Radar upgrades, TR-1 ground intercept facilities, and tactical combat communications equipment. Several very important C^3 programs will receive their first production funds in FY 1982. Examples of these long awaited new starts are the Strategic Air Command (SAC) Digital Network (SACDIN), Minimally Attended Radars for Alaska, a modern SAC worldwide high frequency (HF) radio system, ground interface terminals for Joint Tactical Information Distribution System (JTIDS) equipped Airborne Warning and Control System (AWACS) aircraft, new threat simulator aircrew training equipment, and Strategic Satellite System ground terminals. These funds will also initiate sorely needed logistics replacement programs such as radar scopes, tactical radios, and weather/observation equipment. A more detailed summary follows:

COMMUNICATIONS SECURITY (COMSEC) EQUIPMENT

FY 1982 COMSEC funds will procure equipment required to protect ground elements of the uplink and downlink satellite communications in support of the Defense Support Program, Space Shuttle, the Satellite Control Facility, and special projects. Critical TRI-TAC, Tactical Secure Voice, and secure data COMSEC equipment will also be procured.

INTELLIGENCE PROGRAMS

This category procures hardware and automatic data processing equipment that will enable collection, processing, analysis, and dissemination of time-perishable intelligence data. Modern intelligence training equipment will be procured that will enable military personnel to develop collection and processing skills in signal (SIGINT), human resource (HUMINT), electronic (ELINT), and telemetry (TELINT) fields. Critical RF-4C, TR-1, U-2R, and SR-71 intelligence processing training equipment will also be procured.

ELECTRONICS PROGRAMS

FY 1982 procurement funds will provide an additional three Defense Support Program mobile ground terminals, the fifth and final GEODSS in a relocatable configuration, and the first nine Alaskan Minimally Attended Radars designed to detect aircraft threats. One of the most significant new starts in FY 1982 will be the long awaited SAC worldwide secure digital communications network (SACDIN). A second Transportable Ground Intercept Facility will be procured to support TR-1 operations. All Defense Support Program site mission computers will be replaced. The final tactical reconnaissance remote terminals designed to identify the location of hostile emitters will be procured as will sorely needed weather/observation replacement equipment.

SPECIAL COMMUNICATIONS-ELECTRONICS PROJECTS

FY 1982 funds will procure the first eight of 31 planned ground terminals which will provide an interface for JTIDS equipped E-3A, AWACS aircraft. Communications equipment for Vandenberg AFB will be procured in support of the Space Shuttle program and also for the overseas portion of the SAC worldwide HF command and control network. FY 1982 resources will enable the procurement of 44 automatic matic data processing equipment projects ranging from on-going Worldwide Military Command and Control System requirements through North American Air Defense (NORAD) missile attack verification equipment to worldwide automated transportation aerial port subsystem equipment. Several minor Eastern and Western Test Range upgrades, replacements, and improvements will be funded in addition to the procurement of display, debriefing and Television Ordnance Scoring System equipment. FY 1982 funds will also procure Ground Launched Cruise Missile (GLCM) boundary detection and closed circuit TV perimeter surveillance equipment. The initial acquisition of sensor equipment for Air Base Ground Defense elements will also begin.

AIR FORCE COMMUNICATIONS

FY 1982 funds will be used to procure TRI-TAC troposcatter radios, circuit switches, and tactical facsimile equipment; super high frequency (SHF) satellite terminals for U.S. Readiness Command; and 17 tactical ground mobile force multi-channel satellite terminals. Resources will continue the SCOPE DIAL telephone exchange replacement program and implement the San Antonio Defense Metropolitan Area Telephone System (DMATS) program. Command terminals to support the Strategic Satellite System and the continued replacement of obsolete fixed teletypewriters will also utilize FY 1982 funds.

DEFENSE COMMUNICATIONS AGENCY PROGRAMS

FY 1982 funds continue the Wideband Systems Upgrade projects in Europe. Included are the Digital European Backbone program, which is an on-going effort to improve mainline communications transmission systems in Central Europe, and the NATO Long Term Defense Program (LTDP) Interconnect project, which will improve long haul communications survivability by connecting U.S. systems with those of our NATO and allied partners in Europe. In addition, we are continuing to upgrade control facilities at our mainline communications sites.

ORGANIZATION AND BASE

FY 1982 funds will enable the procurement of realistic combat environment aircrew training equipment that will simulate enemy ground launched threats. The Air Force intends to procure six state-of-the-art ground jammers, a modern surface-to-air missile simulator, an additional anti-aircraft artillary simulator, and two additional ground receivers that evaluate aircrew ECM proficiency. Several long overdue equipment replacement programs will receive FY 1982 funds. New solid-state, digital plan-position-indicator scopes will be procured to replace 1940-1950 vintage radar scopes. The first production option of the AN/GRC-206 communications central, the replacement for the outdated forward air controller jeep mounted communications system, will take place in FY 1982 as will the production options on two other ultra high frequency (UHF) ground radio replacement programs. Two very high frequency (VHF) radio replacement programs will be continued and the high frequency (HF) radio replacement program will be initiated. New rapid burst digital communications terminals will be procured as will numerous types of small tactical communications equipment for rapid deployment combat forces. Within this category we will also procure necessary spare and repair parts.

MODIFICATIONS

FY 1982 funds will enable the initiation of 12 new logistics reliability/maintainability modifications that will increase operational availability and facilitate support of existing tactical, surveillance and warning, fixed facility, and voice communications-electronics systems. Three similar modifications will continue efforts initiated in FY 1981 that affect tactical microwave systems, weather radars, and aircrew combat training equipment. Two traffic control approach and landing system modifications will be completed using FY 1982 funds that will provide increased capability and more reliable equipment. Finally the Thule Ballistic Missile Early Warning System (BMEWS) tracker radar modification initiated in FY 1981 will be completed and the Fylingsdale, UK, tracker radar modification will be started using FY 1982 funds. Also three aging BMEWS radomes will be replaced. And lastly, a program of highest significance will be the initiation of the Air Force SEEK TALK anti-jam ultra high frequency (UHF) modification program.

I will now describe the final budget activity--Other Base Maintenance and Support Equipment.

TABLE V

BUDGET ACTIVITY IV
OTHER BASE MAINTENANCE & SUPPORT EQUIPMENT
(MILLIONS OF DOLLARS)

CATEGORY	FY 1981	FY 1982	Change 81-82
Test Equipment	34.9	36.0	+ 1.1
Personal Safety & Rescue Eq	18.3	30.7	+ 12.4
Depot Plant & Materials Handling Equipment	33.4	38.7	+ 5.3
Electrical Equipment	7.3	13.0	+ 5.7
Base Support Equipment	109.2	258.8	+ 149.6
Special Support Projects	1,736.6	2,228.5	+ 491.9
TOTAL	1,939.7	2,605.6*	+ 665.9*

* Totals do not add due to rounding

The Other Base Maintenance and Support Equipment Program reflected in Table V represents the minimum essential financing needed to operate, maintain, and sustain the existing force. It should be noted that approximately 85 percent of the budget activity is comprised of intelligence related activities. The funding requested will procure a wide range of support equipment used throughout the Air Force. The equipment is critical to our ability to operate and maintain weapon systems as well as provide a worldwide force projection capability. The FY 1982 procurement program includes prudent increases in each category of equipment. This increase, however, does not keep pace with the unfunded requirements that have been growing over the past five years. As a result we have a dwindling inventory of aging, less effective support equipment and an industrial plant that will soon be unable to support the state-of-the-art weapon systems in our Air Force inventory. Support equipment and industrial plants must be modernized if they are to support modern weapon systems. The FY 1982 program includes funds for equipping the Rapid Deployment Force. Funds are provided for a wide range of equipment to support combat flying operations from bare and austere locations where facilities and services are minimal to nonexistent. This budget activity is grouped into six budget categories presented below.

TEST EQUIPMENT

This category provides for common test equipment such as oscilloscopes, signal generators, and frequency meters required to test, align and maintain Air Force weapon systems and support equipment. It also provides equipment for 114 Precision Measurement Equipment Laboratories operated by the Air Force as well as the Aerospace Guidance and Metrology Center. The requested financing of $36.0 million continues the procurement program approved in FY 1981 with priority for unfilled authorizations. A modest replacement program for obsolete, expensive to maintain equipment is also continued. The equipment required is the minimum essential needed to maintain our weapon systems combat ready.

PERSONAL SAFETY & RESCUE EQUIPMENT

Personal safety and rescue equipment requirements total $30.7 million; a $12.4 million increase over FY 1982. The majority of the increase ($5.1 million) is in the Chemical/Biological Defense Program for an aircrew eye-respirator system. Other equipment included in this category are anti-G and anti-exposure suits, life preservers and rafts, gas masks, and emergency breathing apparatus. All equipment is vital to the personal safety of our combat crews, passengers of transport aircraft, missile support personnel, and others engaged in hazardous tasks.

DEPOT PLANT AND MATERIALS HANDLING EQUIPMENT

The $38.7 million requested in this category will provide for mechanized equipment at our air logistics centers and air terminals throughout the world as well as a wide variety of precision maintenance and repair shop equipment at air logistics centers. The mechanized equipment includes items such as overhead monorail systems, driverless tractors, automatic stackers, and automatic storage and retrieval systems. The use of mechanized handling equipment eliminates multiple handling of materials and provides for improved responsiveness and simplification of parts control, inventory, and maintenance. The maintenance and repair shop equipment includes numerically controlled lathes, grinders, drilling machines, welders, and other industrial plant equipment. This equipment is needed to repair engines, airframe components, hydraulic/pneudralic systems, instruments, landing gears, and other weapon system components. The items being acquired are primarily replacement equipment to keep pace with the state-of-the-art, maintain a modern industrial plant, and improve overall productivity of the air logistics center labor force. Equipment selected for replacement is based upon an economic analysis that considers equipment age, condition, criticality, and function.

ELECTRICAL EQUIPMENT

The electrical equipment category includes mobile electric power generators, floodlights and switches, transformers, and controls used for power distribution throughout the Air Force. The requested financing of $13.0 million is $5.7 million more than the prior year. This increase is attributed to an increase in the procurement of mobile electric power generators in the 60 kw to 200 kw range. The majority of the current generators are nonstandard, obsolete units and overhaul costs approximate the cost of new acquisition. The new generators will be a standardized version developed by the Department of Defense Mobile Electric Power Program Office.

BASE SUPPORT EQUIPMENT

This category includes a wide range of programs such as base procured equipment, medical/dental equipment, aircraft arresting barriers, photographic equipment, and pumps and compressors. Also included are two programs to enhance productivity: Productivity Enhancement and Productivity Investment. The Productivity Enhancement ($9.8 million) program permits the Air Force to take advantage quickly of productivity enhancing opportunities that must be amortized within a short period of time. The Productivity Investment Program is a Secretary of Defense sponsored program for predetermined high yield productivity enhancing capital investments which will amortize their investment cost in four years. A new budget line entitled Mobility Equipment ($125.1 million) was established in FY 1982 to provide the first increment of funding to upgrade our existing austere basing sets to support the Rapid Deployment Force. This equipment is required to support aircraft maintenance and operations at austere locations where support facilities and services are minimal to nonexistent. It includes billeting, messing, and housekeeping equipment to support personnel in the deployed environment. Included in Mobility Equipment is $14.5 million of common support equipment for prepositioning in the NATO theater. Also included in this category are funds for spare parts for support equipment procured in this budget project. Total financing requested is $258.8 million. This represents an increase of $149.6 million over the previous year.

SPECIAL SUPPORT PROJECTS

Special Support Projects is the largest category in this budget activity. The $2,228.5 million request is composed largely of specialized support to various classified programs. Other programs in this category are Industrial Preparedness and Modifications. A $321 million increase in Selected Activities and $159 million increase in the Special Update Program account for the largest portion of the $491.9 million increase from FY 1981 to FY 1982.

OVERVIEW STATEMENT

Senator **Rudman**. Why don't you proceed with a general overview of what you would like to tell us this morning.

General **Burke**. That is fine, sir.

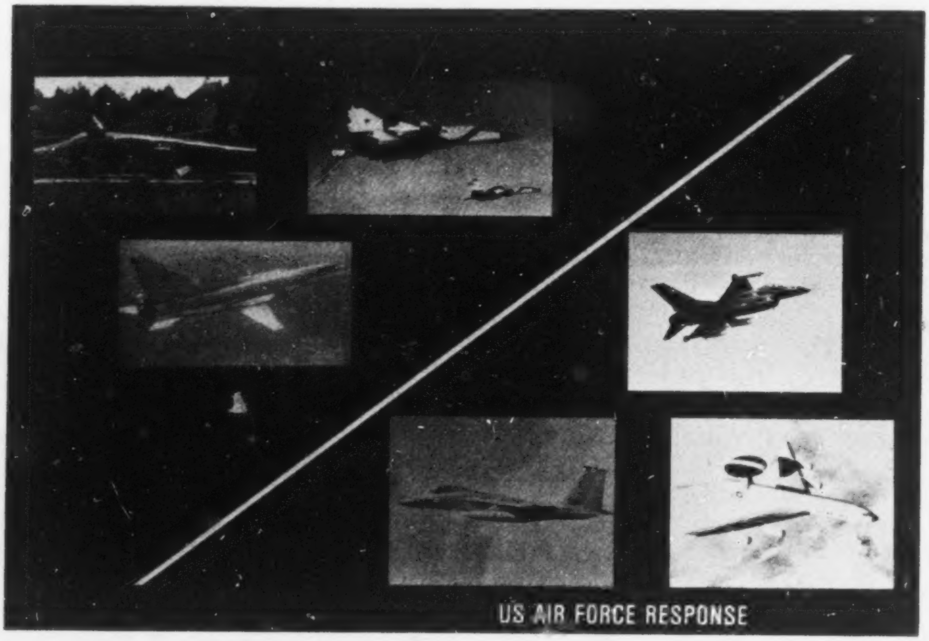


Chart 1

AIR FORCE RESPONSE TO SOVIET THREAT

Very quickly and putting together the 1982 budget and the 1982 budget as amended by the incoming Reagan administration, the Air Force did that with a very careful consideration of the rapidly evolving and increasing Soviet threat, with particular emphasis obviously as it applies to the Air Force. Then we tried to develop a set of priorities and to allocate the funds that were provided to us in a manner that met that threat in what we hope is a balanced way.

SOVIET MILITARY CAPABILITY
MILITARY INVESTMENT
QUANTITY WITH QUALITY

CHART 2

UNITED STATES/SOVIET MILITARY FUNDING DISPARITIES

In looking at our opposite numbers in the Soviet Union, there are two very striking points that emerge rather graphically. One is the tremendous disparity in the Soviet investment in their military forces as compared to ours over the past decade or so, with the result that we have seen a very marked shift in the qualitative aspects of the Soviet forces which have always been large in number but generally not of a quality of ours, and we see that changing. I will illustrate both of those points here in just a minute.

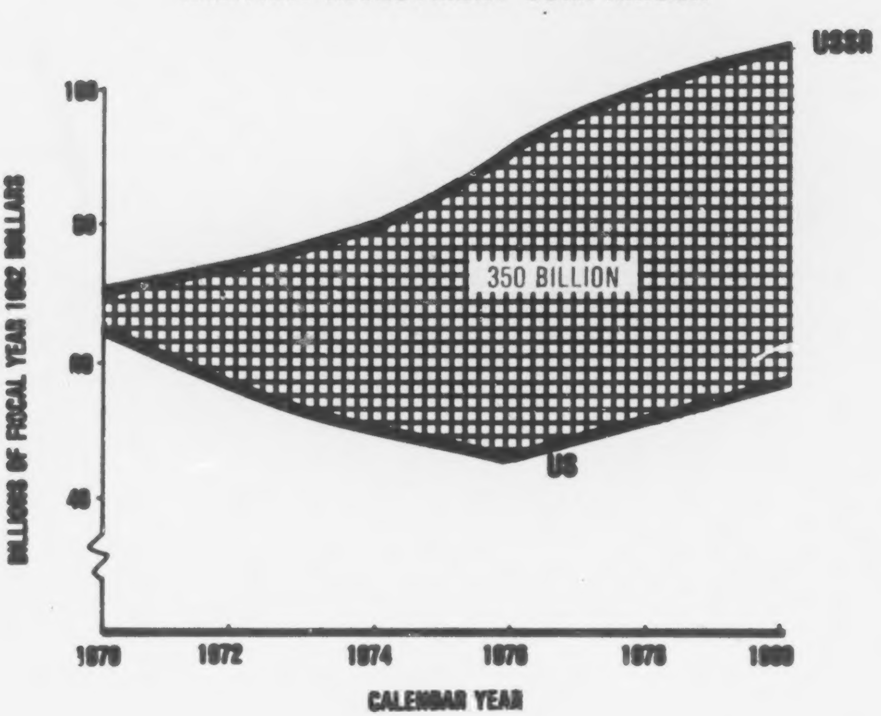


CHART 3

NIE IN 1982 DOLLARS

This is a chart from the National Intelligence Estimate in 1982 dollars, the same type of dollars we are looking at in the budget. It shows at the beginning of the decade of the 1970's that the United States and the Soviet Union were making essentially equal capital investments. This includes just the sorts of things you are looking at today, research and development, and buying of missiles and aircraft; it also includes military construction which you are not looking at. That is a relatively small account.

So we started the 1970's, spending about the same and buying about the same. This doesn't look at payroll and operating costs but capital investment. The Soviets increased by on the order of 3 to 5 percent in real terms each year during that period and the United States went through a decline until 1976, and then a relatively modest upturn, leading to this very great disparity as late as 1980. But cumulatively that adds up to $350 billion more investment for the Soviets than for us during that period of time.

SOVIET MILITARY CAPABILITY
QUANTITY
TREND
QUALITY WITH QUANTITY

CHART 4

SOVIET QUANTITATIVE EDGE

As I indicated earlier they have retained the quantitative edge. The Soviets typically have kept two and three times as many tanks and artillery pieces and fighter aircraft and attack submarines. In the past we derived a great deal of confidence from the fact that ours were of a much higher quality than theirs. That still is true to some extent but by no means to the extent it was a few years ago. The Soviets are rapidly closing that qualitative gap as well.

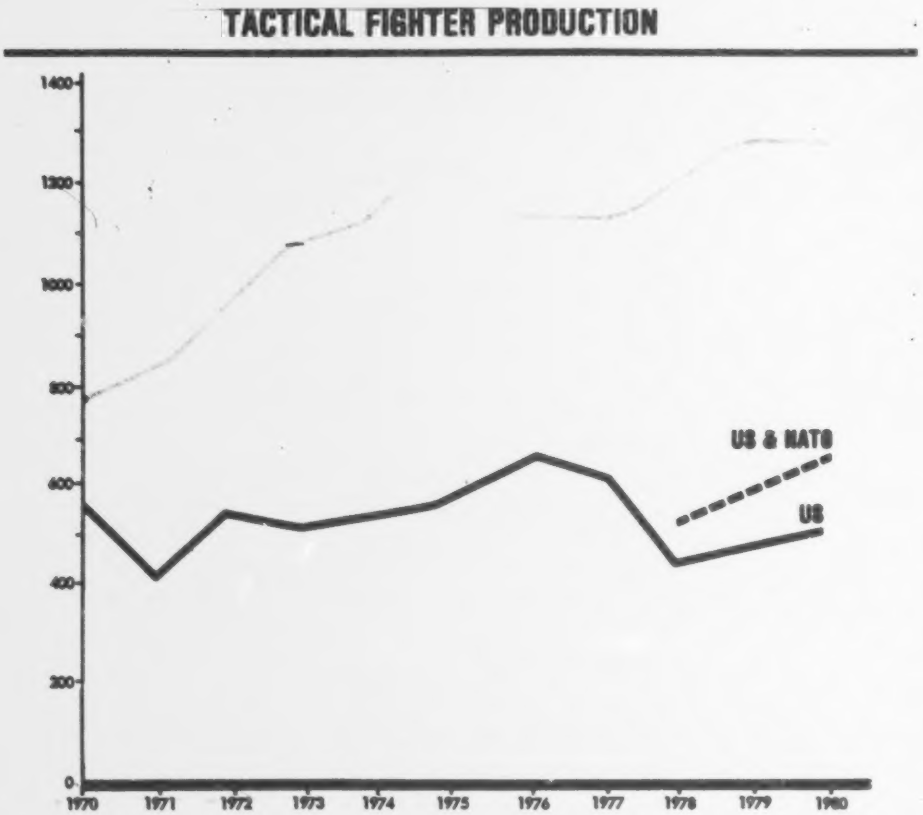


CHART 5

SOVIET TACTICAL FIGHTER PRODUCTION

Just to illustrate, this happens to be the thing that we follow very closely, that is Soviet tactical fighter production. It shows that last year, for instance, the Soviet Union produced 1,300 modern tactical fighter aircraft. The United States, including not only the Air Force but Navy and Marine Corps, produced about 600. If we would factor in those of our NATO allies, we are still just about half of what the Soviet Union turned out. The Soviet Union is building a new fighter aircraft every 7 hours. If we had that production we would equip the U.S. active force every 18 months.

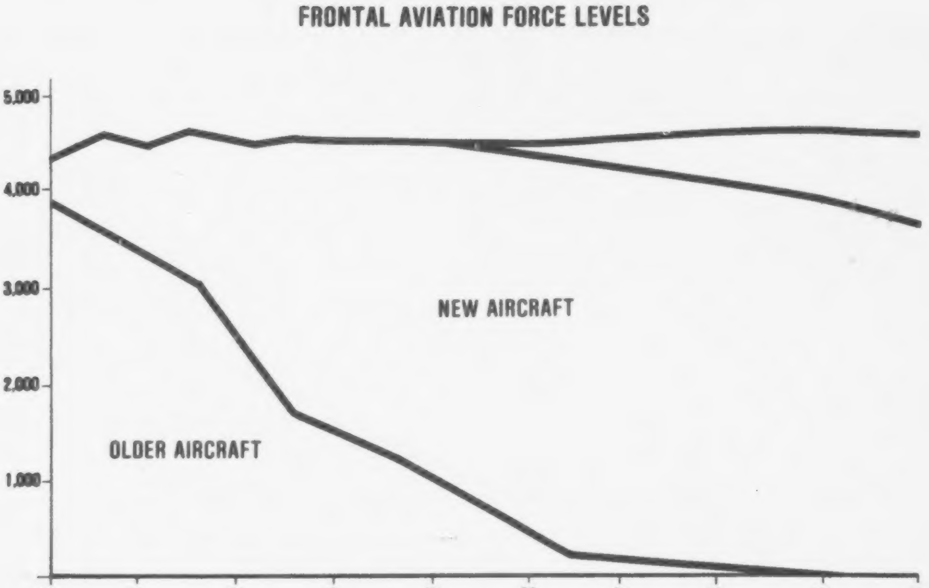


CHART 6

FRONTAL AVIATION FORCES

So they are turning them out in very large numbers. The inevitable consequence of that is that they have very rapidly modernized their frontal aviation forces. Typically they are keeping about 4,300 fighter aircraft in what they call frontal aviation. These are old aircraft and include everything up through the MIG-21, which is not all that old an airplane. The new aircraft are MIG-23's, MIG-25's and SU-24's. These are all relatively new and very capable aircraft. You can see that even by now they have essentially removed all of these old aircraft from the frontal aviation, and are equipped with very capable aircraft. We are seeing the research and development that is going to lead to some even newer ones quite soon. But the number is still staying high.

MIG-23/FLOGGER

CHART 7

RUSSIAN JET AIRCRAFT CAPABILITY

Just as an illustration of one aircraft, to make a point, they are no longer turning out as they did in the 1950's and 1960's, unsophisticated and not very capable airplanes. This is a MIG-23 and the most startling thing I can say about it is that of the 1,300 fighters they are producing each year, about half are MIG-23's, a production rate that nobody or no group of countries in the Western World can begin to approach. It is a good sized airplane, substantially larger than an F-16. It has a modern attack radar in it, it has a swing wing like an F-111 and it has modern electronic countermeasures.

We estimate that this airplane would cost at least 50 percent more than an F-16 to build, and that is what they are turning out in larger numbers.

SOVIET MILITARY CAPABILITY

CHART 8

STRATEGIC NUCLEAR FORCE CAPABILITY

That captial investment, the retention of large numbers, and the addition of much higher quality in their forces has put the Soviet Union in a position which causes all of us great concern. In terms of the strategic nuclear forces, those forces that pose the direct and immediate danger to the heartland of this country, the Soviet Union entered the 1970's clearly inferior to us and they left the 1970's at least our equal in terms of a strategic nuclear force.

There is steady growth in already formidable forces against our allies in Western Europe. An illustration not only of the capability but the will to use forces for intervention to work their political will is the case of Afghanistan; even now one must imagine that with that great force they look with hungry eyes at the all too vulnerable supply lines that provide us and our allies.

FY 82 BUDGET PRIORITIES

STRATEGIC FORCE MODERNIZATION

READINESS AND SUSTAINABILITY

GENERAL PURPOSE FORCE MODERNIZATION

CHART 9

PRIORITIES IN 1982 BUDGET

So out of that not very happy view of the world, the Air Force took stock of where it was and where it thought it ought to be going, and in the 1982 budget we thought our first priority clearly was to look after the two legs of the strategic triad for which we are responsible, the land-based ICBM and the manned bomber and not to let that balance erode further.

Second, I think the events of Iran and Afghanistan probably somewhat rudely brought home to many of us the fact that war was perhaps a more real possibility, even a more imminent possibility than we had thought in the past, and that it was therefore incumbent upon us to extract all of the capability we could from the forces that we already owned. That led to very substantial increases in the accounts that support readiness and sustainability.

Then after we did those two, with whatever funds were left we did as best we could to modernize our general purpose forces by buying tactical fighter aircraft and so forth.

LRCA
MX
B52/ALCM
STRATEGIC FORCE
KC 135 REENGINE
OTHR
AFSATCOM

CHART 10

STRATEGIC FORCE

The results, in very broad brush terms, are highlighted by the following details of the budget. The first priority is strategic forces and our biggest single items are $2.4 billion for the M-X missile, and nearly $2½ billion to embark on a new long range combat aircraft, the multirole bomber as it is called. We are continuing with our B-52 ALCM conversion, the re-engining of our tanker fleet to increase our air refueling capability, some modest efforts in the air defense such as over-the-horizon radar, and in a strategic C^3 for our Air Force satellite communication programs.

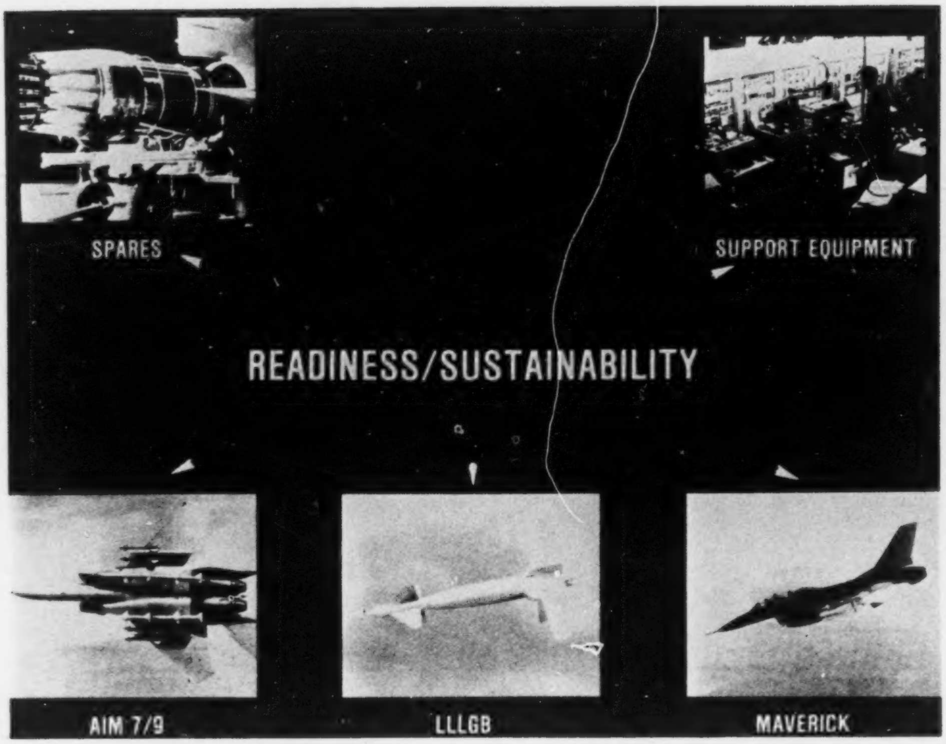

SPARES
SUPPORT EQUIPMENT
READINESS/SUSTAINABILITY
AIM 7/9
LLLGB
MAVERICK

CHART 11

SPARES ACCOUNT INCREASES

In the second area, there is a very large increase in the Air Force spares account this year, up to its highest level, and increases in support equipment necessary to provide the high sortie rates we were trying to obtain from our aircraft. Also, there are substantially larger increases in the more desirable munitions such as the air-to-air AIM-7's and AIM-9's, laser guided bombs and Maverick ground attack missiles.

F-16
F-15
A-10
GENERAL PURPOSE FORCE
ADV.
TACTICAL FIGHTER
CX
H-X

CHART 12

GENERAL PURPOSE FORCES

With what was left we then turned our attention to the general purpose forces, buying as many of the F–16's and F–15's and A–10's as we were able to. We began an embryonic program looking to a new tactical fighter which would be available to us around 1992, added a small number of additional helicopters and proposed continued development of increased airlift capability.

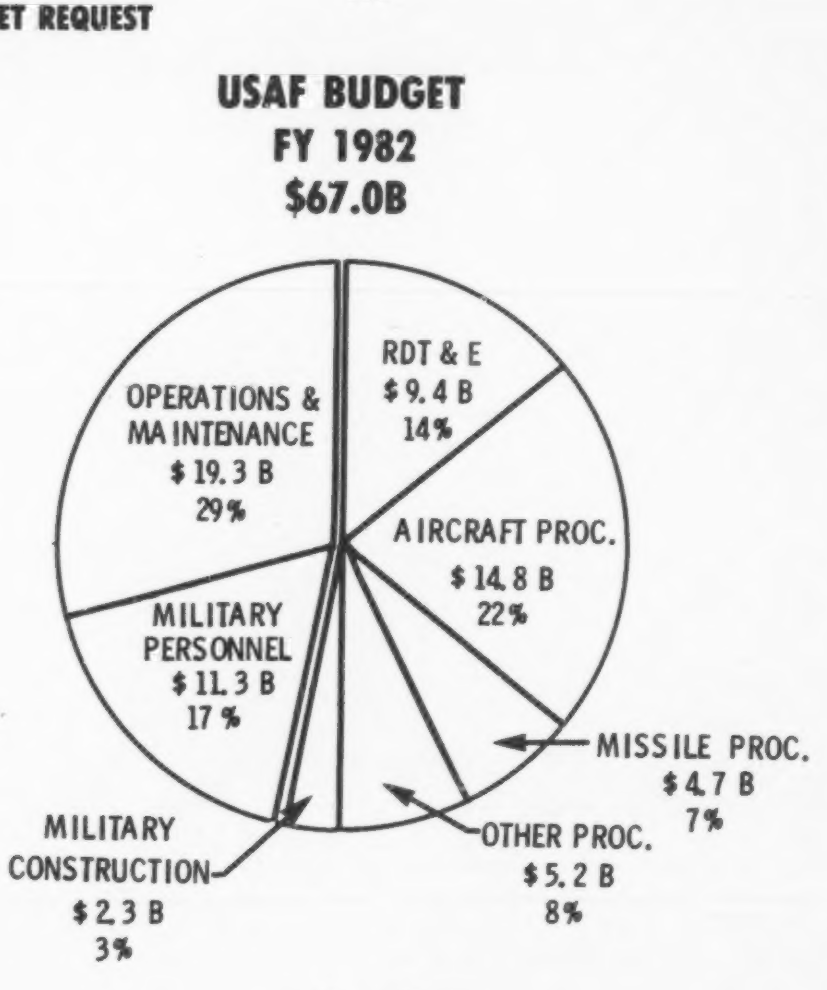


CHART 13

BUDGET BREAKDOWN

The budget then, with that sense of priorities, was divided as shown here. It has relatively little real increase in the operations and maintenance account, and only a slight increase in military personnel as a consequence of the pay raises. In the accounts under consideration by this committee—R.D.T. & E., Aircraft Procurement, Missile Procurement and Other Procurement—some very heavy increases appear in real terms.

All told, this adds up to $34 billion of the Air Force's $67 billion request, and that is what is under consideration by this committee today.

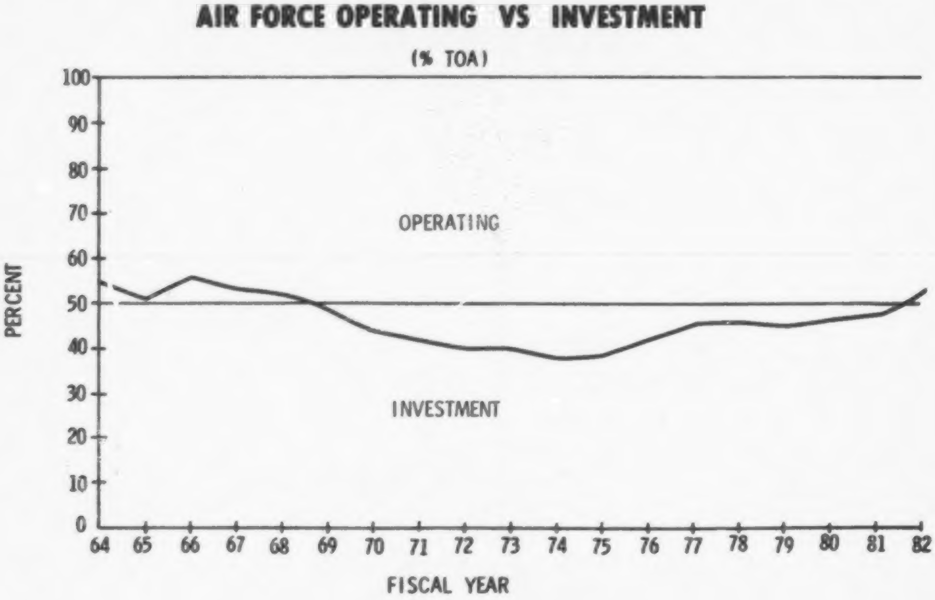


CHART 14

OPERATING VERSUS INVESTMENT FUNDS

One trend we watch very carefully is the ratio of what we are able to put into investment as opposed to that we are required to have to operate the forces day by day. Historically we have averaged about a 50-50 split. In those lean days of the early 1970's, that dropped down to a rather dangerous 34 percent, with the remaining 66 percent being consumed by the annual operating expenses. That started back up around 1976 and it reached its highest level in some time here in the 1982 budget.

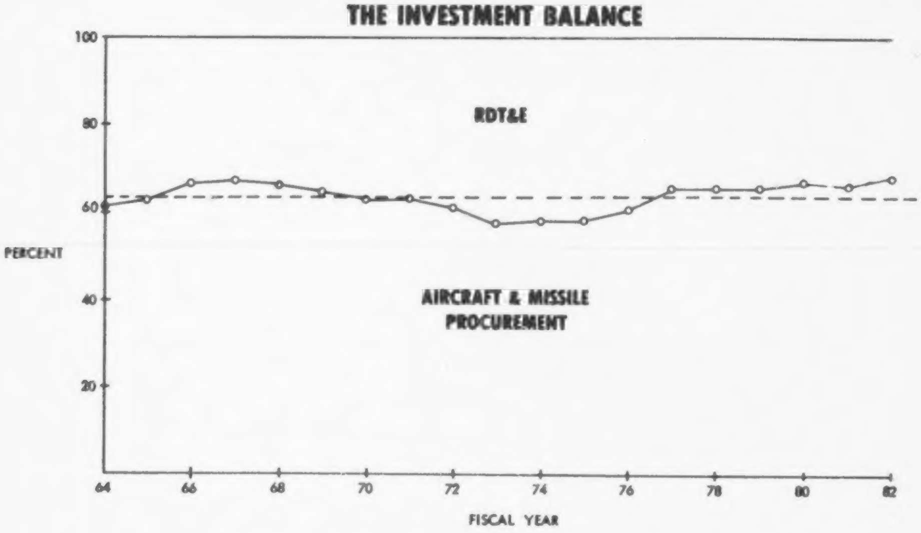


CHART 15

SPENDING RATIO

Similarly we watch very carefully the ratio between what we spend in research and development, which is important, but less important than what we ultimately spend in aircraft and missile procurement because that is what results in the equipment in the hands of the operational forces. That has averaged about 64 percent going into procurement over the years; again a healthy trend. It is up to about 67 percent in the 1982 budget.

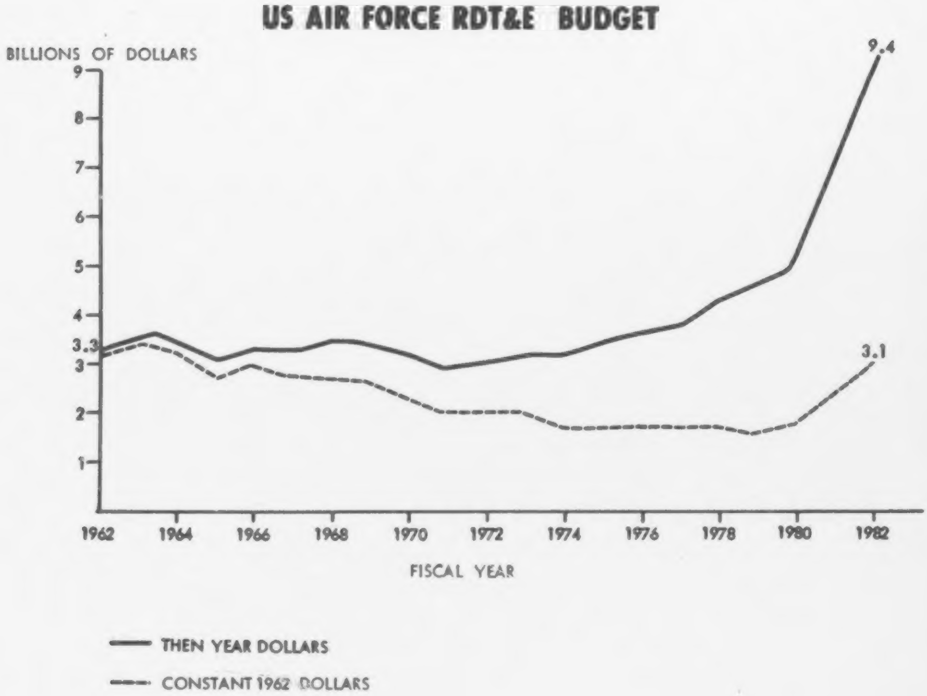


CHART 16

BUDGET CATEGORIES

Just looking very quickly at each of the budget categories, the R.D.T. & E. account is up to a very substantial $9.4 billion. If one compares that, however, in real terms, that just is about what we were spending in 1962, if the inflation factors are taken out.

Senator RUDMAN. Would you put the R.D.T. & E. chart back on for a moment.

General BURKE. Yes, here it is.

Senator RUDMAN. Thank you.

FY 1982 RDT&E REQUEST

$9.4B

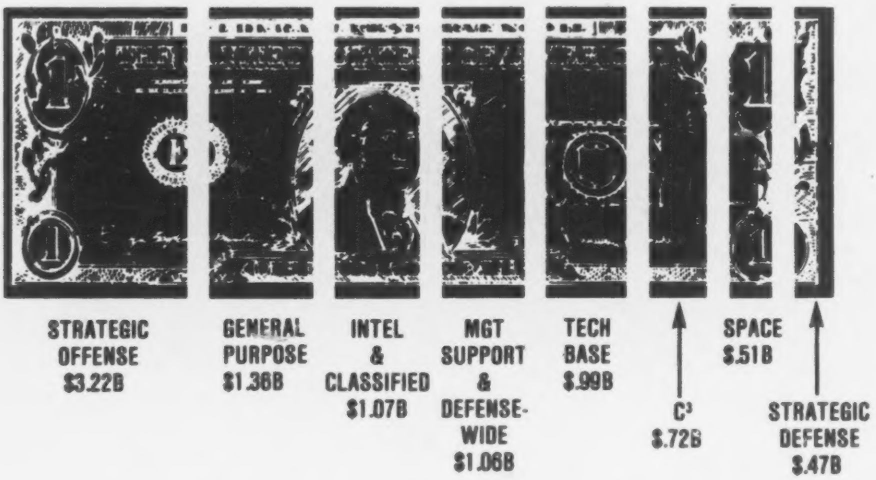


CHART 17

R.D.T. & E. BREAKDOWN

General BURKE. That $9.4 billion is divided as shown. Not surprisingly the largest amount is strategic forces, with the M-X and new long-range combat aircraft accounting for a great deal of that. The general purpose efforts are scattered through a wide number of programs, including the C-X and intelligence and classified activities that are considered in another hearing.

Management support is the O. & M., if you will, for the Air Force System Command and the operation of our ranges and the programs that are spread throughout these areas, such as engine development programs. Our technology base and explorations account for that, and the C^3, command control operations, and finally strategic defense. That is how the research and development account is distributed this year.

USAF AIRCRAFT PROCUREMENT PURCHASING POWER (1970-82)

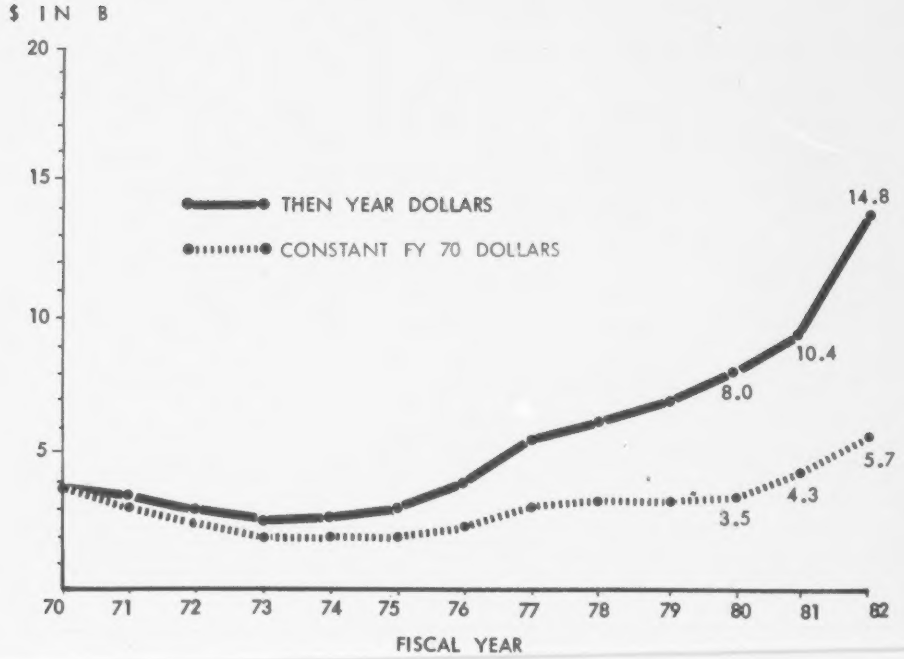


Chart 18

AIRCRAFT PROCUREMENT

Looking at the 3010, the aircraft procurement account, again one sees about the same sorts of trends, a very large increase until inflation is factored out and then it is back to not much different than it was at the beginning of the decade. In fact in 1952 in these same dollars, we were spending $15 billion for aircraft procurement, three times that amount.

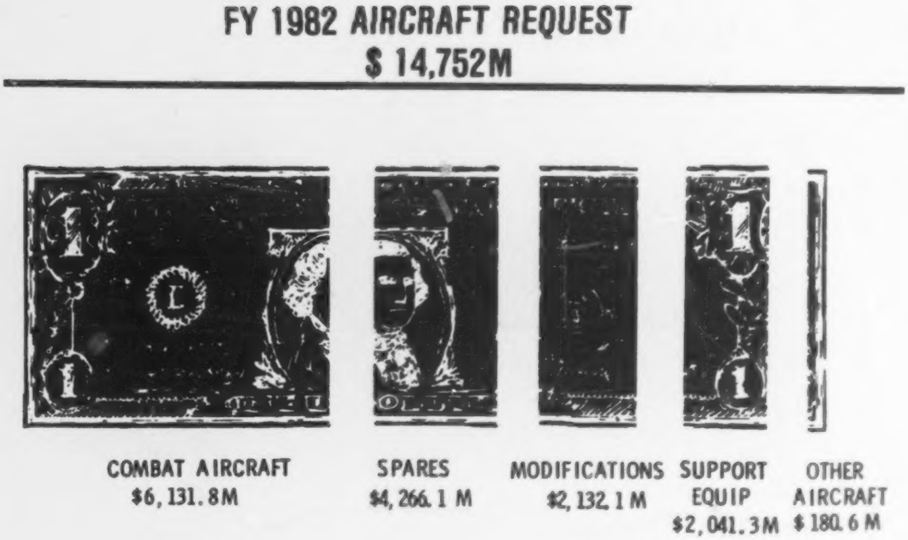


CHART 19

COMBAT AIRCRAFT

That is divided as shown here. In combat aircraft we are buying 225 fighter type aircraft each year or proposing to, 120 F–16's, 60 A–10's, and 42 F–15's. In addition we are proposing to buy eight KC–10's, six TR–1's, and our helicopters. This is the largest spares buy in Air Force history, something over $4 billion, and includes initial spares that are associated with these 253 new airplanes. That is just less than a billion dollars, and then something over $3 billion for replenishment spares, both peacetime operating stocks and war reserves.

Modifications are quite large numbers, and the B–52 modification accounts for a great deal of that. The KC–135 reengine would be another large program as would conversion of our F–111 to the EF–111 electronic version. Support equipment, all of the test equipment which is necessary to keep the airplanes and their components working and flying, accounts for a little over $2 billion. The other aircraft I have already mentioned.

**USAF MISSILE PROCUREMENT
PURCHASING POWER (1970-82)**

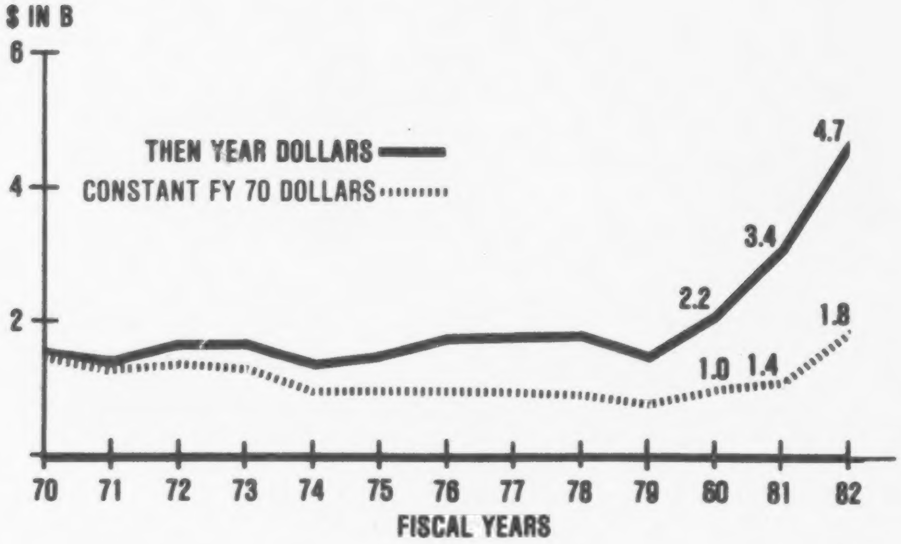


CHART 20

MISSILE PROCUREMENT

In the 3020 account, the missile procurement, again it is about the same sort of representation. This is about where we were in 1970 in real terms, although it is $4.7 billion here.

PROCUREMENT

FY 1982 MISSILE REQUEST
$4,658.2

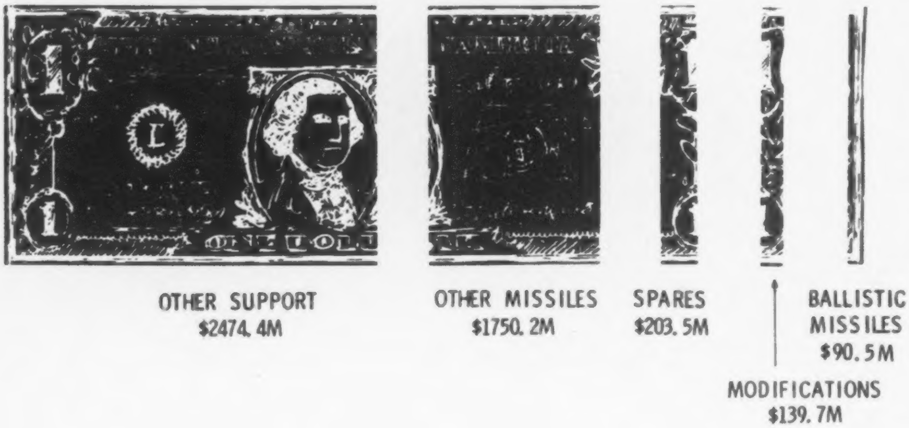
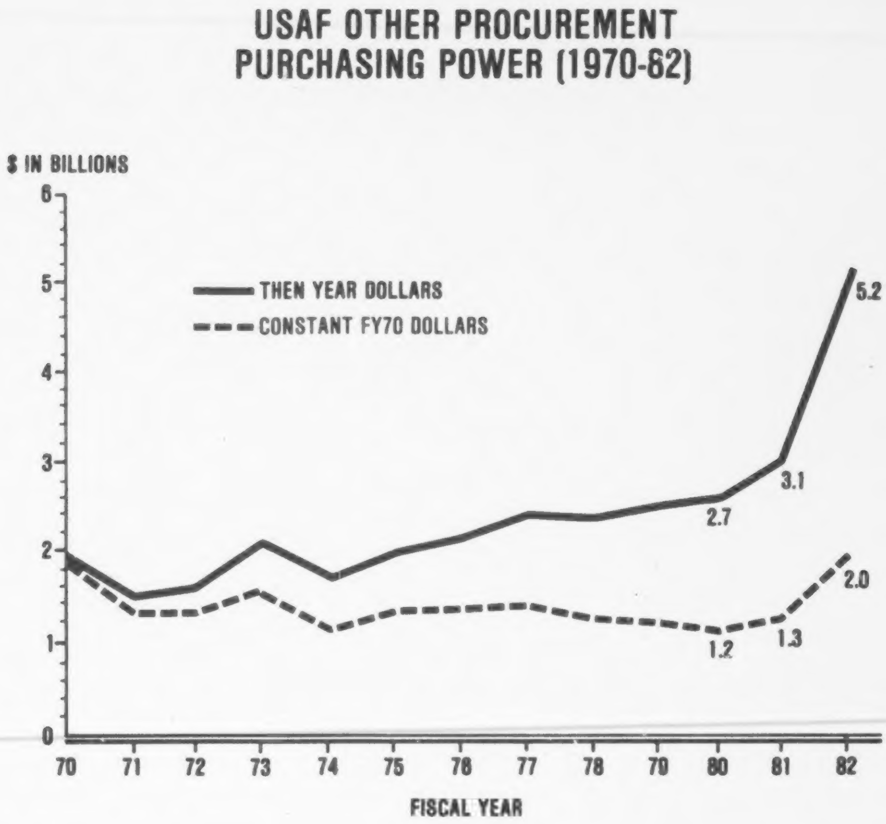


Chart 21

INTELLIGENCE PROGRAMS

We use this account for various intelligence and classified programs, and a number of them are imbedded in this very general category called "Other support," and that is how it comes out so large. Other missiles means all other missiles besides ICBM, and that includes the air launch cruise missile, tactical missiles, and the ground launch cruise missiles. It includes the air-to-air missiles, AIM-7's and AIM-9's and such as the HARM and the Maverick, and even a surface-to-air missile. We are buying the Rapier from the British.

These spares are associated here with the missiles we are buying. There are some modest sums mostly for Minuteman and Titan, and in the ballistic missile category, we are not buying any. For the most part that is buying more Mark 12A warheads for the Minuteman and some C^3 improvements.



USAF OTHER PROCUREMENT PURCHASING POWER (1970-82)

CHART 22

OTHER PROCUREMENT

Again the same sort of a trend line is here for Other procurement.

REQUEST

FY 1982 OTHER PROCUREMENT REQUEST
$ 5,196.2 M

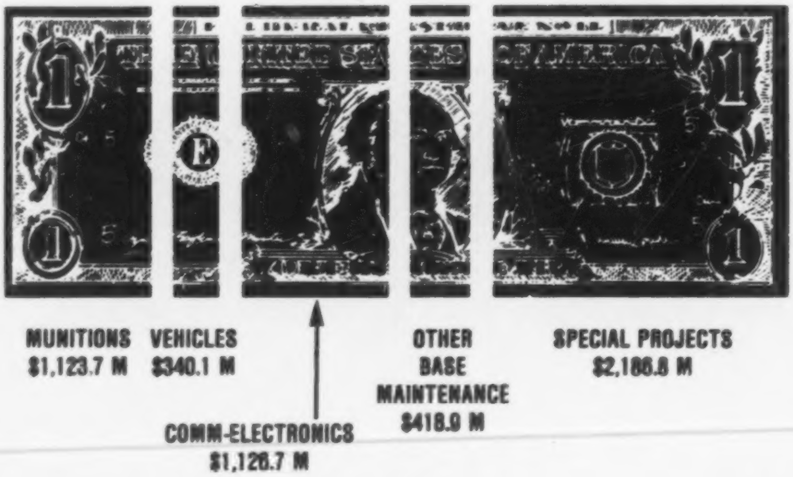


CHART 28

Finally, this is the fiscal year 1982 3080 account, Other procurement, and a very substantial increase here. A great deal of that is associated with an increased buy of war reserve munitions, and that is a very substantial sum. Also we have vehicles, communications and electronic equipment, other base maintenance support and again some classified projects in that account.

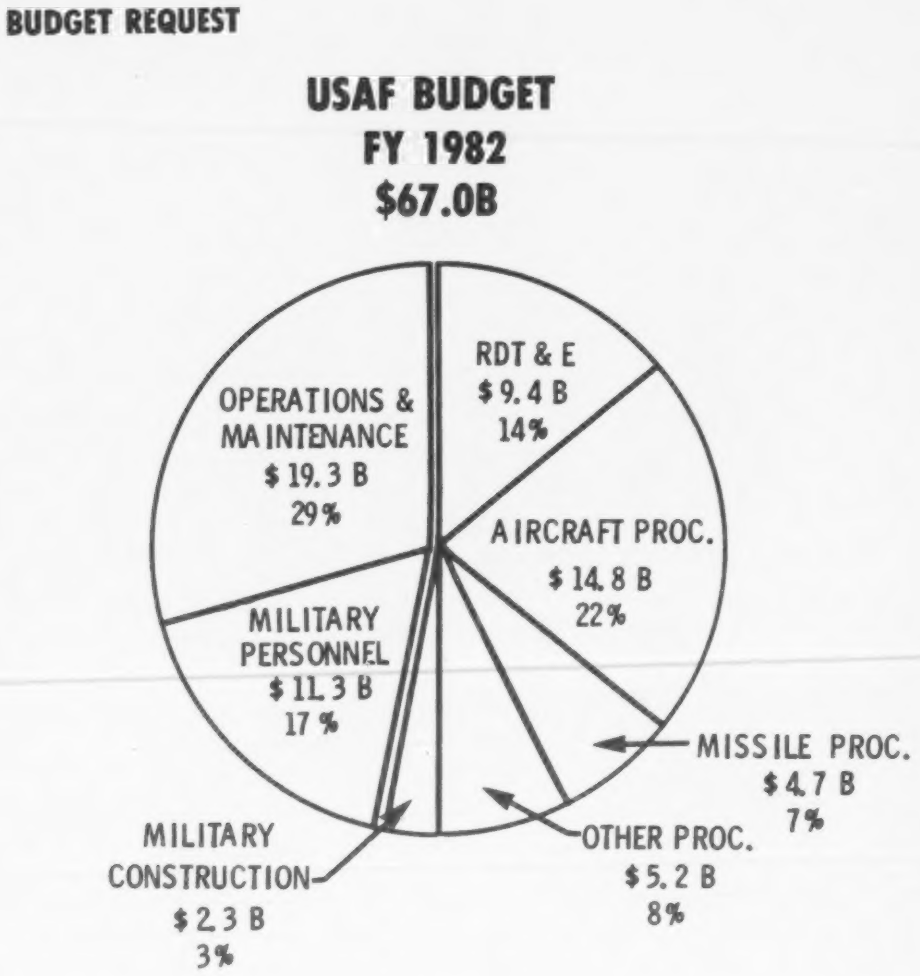


CHART 24

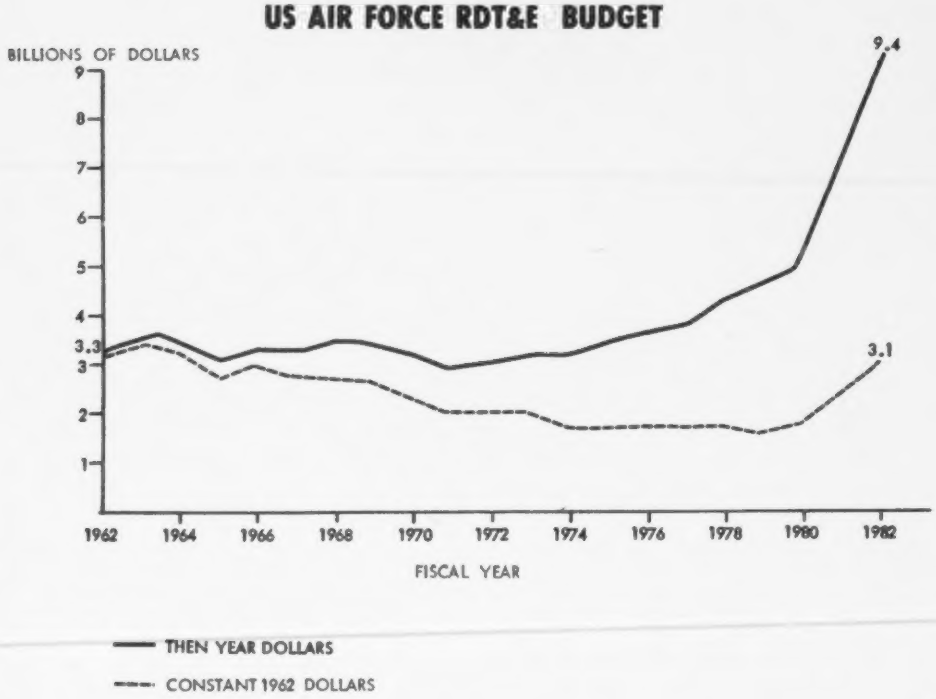
PIE CHART ON R. & D.

That brings us back to our pie chart. Research and development is $9.4 billion, Aircraft and missile procurement are as shown and Other procurement is $5.2 billion.

That is a very quick look at a very large budget; now we would like to be available to answer any questions.

INFLATION ESTIMATING

Senator RUDMAN. I wonder if you could have your slide operator back there put the chart back up. It was the very first chart that you showed in relation to relative inflation rates; the one I asked you to show a second time. Essentially it showed equalized costs and inflation.



US AIR FORCE RDT&E BUDGET

Chart 25

R.D.T. & E. TREND CHART

General **Burke**. That is the R.D.T. & E. trend chart.

Senator **Rudman**. And I just thought that it might be good to have up there in light of some of the questions I would like to discuss with you.

Yesterday we had an interesting discussion with the Secretary and the Chief concerning this whole procurement problem in terms of estimates of inflation. I am very anxious to talk to you this morning because you probably are closer to the impact of that problem and how it affects your procurement than anyone else, considering your responsibilities. I asked General Browning yesterday this question and I would like to ask you the same question.

That essentially is, What is your best estimate during the past year, first as to the general impact of inflation in terms of percentage on your procurement?

General **Burke**. During the past year I think inflation for the areas we are discussing here was running something probably a little better than 10 percent on the average as shown by the Department of Commerce GNP deflator, and that led to over $1 billion in the 1981 supplemental request. That is what we call the "facts of life." It was largely a consequence of that inflation.

HIGH TECHNOLOGY INFLATION

Senator **Rudman**. Now the second question I have is, looking now at those high technology programs you have and those programs which essentially are within the defense industry in procurement, it is my understanding that inflation in that category has been substantially higher than 10 percent, am I correct?

General **Burke**. It is spotty. In some areas, especially anything that uses titanium, it has gone up nearly 400 percent in the last 4 years. Other areas will be about the same. The crunch for those critical materials seems to be leveling about now and I hope that is going to be a trend of some standing and not just a minor perturbation in a steady upward rise.

STRATEGIC MATERIAL ANALYSIS

Senator **Schmitt**. Could you yield there? Have you done an in-house analysis mineral by mineral of the embargo and aircraft procurement programs and R.D.T. & E. programs?

General **Burke**. General Slay looked very carefully at that question as part of his major study on industrial preparedness. The quick answer to it is that we are critically dependent and we do have to buy minerals.

Senator **Schmitt**. Could we have a summary of that or whatever other materials you have, mineral by mineral in the strategic account? We can better look at what it is and what might come from a particular country.

General **Burke**. We would be happy to do that.

Sentor **Schmitt**. Thank you.

[The information follows:]

NATIONAL DEFENSE STOCKPILE OF STRATEGIC AND CRITICAL MATERIALS

(The information follows:)

Commodity	Country of Origin
1. Aluminum Metal Group	Jamaica, Guinea, Australia
2. Aluminum Oxide, Abrasive Grain Group	U.S., Canada
3. Antimony	Mainland China, Bolivia, Mexico
4. Asbestos, Amosite	South Africa
5. Asbestos, Chrysotile	Canada, South Africa
6. Bauxite, Refractory	Guyana, Mainland China
7. Beryllium Metal Group	Brazil, India
8. Bismuth	Peru, Mexico, Federal Republic of Germany
9. Cadmium	Canada, Australia, Mexico
10. Castor Oil, Sebacic Acid	Brazil
11. Chemical and Metallurgical Chromium Group	South Africa, Turkey, Zimbabwe
12. Chromite, Refractory Grade Ore	Philippines
13. Cobalt	Zaire, Zambia
14. Columbium Bearing Materials Group	Brazil, Canada, Thailand
15. Copper	U.S., Canada, Chile
16. Cordage Fibers, Abaca	Philippines
17. Cordage Fibers, Sisal	Brazil, Haiti
18. Diamond, Industrial Group	Ireland, South Africa, Belgium
19. Feathers and Down	Mainland China, France
20. Fluorspar, Acid Grade	U.S., Mexico

STOCKPILE CON'T

21.	Fluorspar, Metallurgical Grade	Mexico
22.	Graphite, Natural - Ceylon, Amorphous Lump	Ceylon
23.	Graphite, Natural - Malagasy Crystalline	Malagasy
24.	Graphite, Natural - Other than Ceylon and Malagasy	Mexico
25.	Iodine	Japan, Chile
26.	Jewel Bearings	Switzerland
27.	Lead	U.S., Mexico, Honduras
28.	Manganese, Dioxide, Battery Grade Group	Gabon, Mexico
29.	Chemical and Metallurgical Manganese Group	South Africa, France
30.	Mercury	Spain, Algeria, Italy
31.	Mica, Muscovite Block	India
32.	Mica, Muscovite Film	India
33.	Mica, Muscovite Splittings	India
34.	Mica, Phlogopite Block	India
35.	Mica, Phlogopite Splittings	India
36.	Molybdenum Group	U.S.
37.	Nickel	Canada, Norway
38.	Opium Group	India, Turkey
39.	Platinum Group Metals Iridum	South Africa, Russia
40.	Platinum Group Metals, Palladium	South Africa, Russia

STOCKPILE CON'T

41.	Platinum Group Metals, Platinum	South Africa, Russia
42.	Pyrethrum	Ecuador, Kenya
43.	Quartz Crystals	Brazil
44.	Quinidine	West Germany, Netherlands
45.	Quinine	Netherlands, West Germany
46.	Rubber	Indonesia, Malaysia
47.	Rutile	Australia
48.	Sapphire and Ruby	Switzerland
49.	Shellac	Thailand, India
50.	Silicon Carbide, Crude	Canada
51.	Silver(Fine)	U.S., Canada
52.	Talc, Steatite Block and Lump	U.S.
53.	Tantalum Bearing Materials Group	Thailand, Canada Malaysia
54.	Thorium Nitrate	France
55.	Tin	Malaysia, Bolivia
56.	Titanium Sponge	U.S., Japan
57.	Tungsten Bearing Materials Group	Canada, Bolivia
58.	Vanadium Group	South Africa, Chile
59.	Vegetable Tannin Extract, Chestnut	Italy, France
60.	Vegetable Tannin Extract, Quebracho	Argentina, Paraguay
61.	Vegetable Tannin Extract, Wattle	South Africa, Brazil
62.	Zinc	Canada

Senator **Rudman**. It is our understanding that the procurement programs of the Army and Navy and Air Force, that the inflation rate, and not the cost error rate or the essential estimator rate, but the true inflation rate in some of these areas has been running between 20 and 25 percent. What has been your experience in some of these areas?

General **Burke**. I think most of ours would be something under that, but I am sure if we looked there we could find some instances of that.

[The information follows:]

Procurement Inflation Rates

There are numerous cost estimates of Air Force systems each year. In many cases certain selected materials or parts increase much more than the aggregate end item. For example, in a January 1981 Defense Science Board report on Industrial Responsiveness selected materials such as Molybdenum and gold increased over 250 percent. Likewise, certain parts such as generators and capacitors were up over 30 percent. However, a recent report on price changes in DOD weapon systems by the consultant firm of Coopers & Lybrand indicated that the aggregate rate of price increase for a sample of DOD weapon systems increased only 7-8 percent between fiscal years 1978-1979, and 15 percent between fiscal years 1979-1980.

INFLATION RATES USED IN THE BUDGET

Senator **Rudman**. The inflation rates that you have used in terms of your submissions to the committee, the Air Force generally, have been 8.4.

General **Burke**. I believe it is 8.7 percent.

Senator **Rudman**. And that was furnished to you by OMB?

General **Burke**. That is right.

Senator **Rudman**. If you were told by this committee, as our chairman indicated yesterday, that we weren't going to look too favorably on supplementals in the future for things that we should have considered at this time, would you be comfortable with that 8.7 rate or would you prefer to have something else? This is a personal opinion I am asking you for.

General **Burke**. No, sir, I think if it were clearly stipulated we wouldn't or couldn't come back to the well, I would feel more comfortable with a higher inflation expectation.

Senator **Rudman**. Well, this committee has in fact pretty much decided to move that figure to 10, which we believe realistically approaches what the inflation rate would be.

Senator **Schmitt**. Some of us believe that. I think that is an improvement but I don't think it is realistic.

General **Burke**. That is optimistic.

Senator **Rudman**. Senator Schmitt makes an excellent point; that point being that we really ought not to be having pipedreams and not come up with a budget based on 8.7 when we are going to see 10. Many of our members including myself believe that that may be very optimistic. That chart probably proves this point. Although the President's program I am sure is going to work, I am not sure it will work fast enough to affect fiscal 1982 procurement.

STRATEGIC MINERAL DEPENDENCE ON FOREIGN SOURCES

Senator **Schmitt**. Could I add just another request to the strategic mineral impact analysis, and also the analysis of any manufactured components that we are now dependent upon foreign sources. There are a few, I think, at least in the commercial sector there are, and I don't know whether you guys are dependent upon any components coming from abroad or not.

General BURKE. There is production machinery coming into the defense sector from Japan that can be replaced but at a cost of time.

Senator SCHMITT. If you can provide us with that I would appreciate it.

General BURKE. You can get it in 18 months from the Japanese sources and it takes 36 from American sources, and that type of thing.

Senator SCHMITT. Those kind of things, yes, and as I understand the components of the 747 and some of the new Boeing aircraft and maybe others are being manufactured solely in Italy and a few other places. So if those are of importance to you the committee would like to know what your vulnerability might be in those areas.

General BURKE. We would be happy to do that.

Senator SCHMITT. Thank you.

[The information follows:]

DEPENDENCY ON FOREIGN MANUFACTURED COMPONENTS

Presently, we are not dependent upon Italian manufacturers for any of our components. In the case of Japan, we are dependent on their manufacturers for approximately 20 items. These items could be produced in the U.S. but their companies proprietary rights or the economics of the situation resulted in our buying these items from them. Our largest foreign dependency is with the United Kingdom. We are dependent on English companies for approximately 800 items. These are mainly TF41 engine components. This engine, which goes in the A-7, is a joint U.S./U.K, venture and a portion is being built in England. The capability exists to produce all of these parts in the U.S. Although Canada is not considered a foreign source, approximately 300 of our components are produced there.

The impact of this foreign dependency is minimal and we do not consider ourselves significantly vulnerable in this area.

COST GROWTH OF HIGH TECHNOLOGY WEAPONS

Senator RUDMAN. Before turning the questioning over to Senator Schmitt I wish to ask you one more general question which I asked all of the witnesses here from various services who hold positions similar to yours. I am sure you read the day before yesterday Secretary Carlucci's address on the problem of the cost growth of high technology weapons systems. The track record of the Armed Forces in that procurement has been less than, in my view, satisfactory, due to a number of reasons, but not all the fault of the services. Many in fact are the fault of the defense industry. One of the problems that everyone seems to agree exists is a failure of setting designs in concrete early on and then tying those designs to cost in multiyear procurement. I would like to know what you are doing in your office to look at this as part of Secretary Carlucci's investigation and what the Air Force feels can be done to start limiting some of these enormous cost growths which are not related to inflation.

Let me point out to you that so far about one-third of the cost growth in these areas has been inflation, and two-thirds errors in estimates by the services and estimating errors by the contractors design changes and state of the art achievements beyond the scope of what was possible. This results in enormous cost.

I would like to know how that problem is being approached.

General **Burke**. There are two aspects to your question. First in regard to multiyear procurement, the Air Force is strongly committed to that principle. In fact it was the Air Force again and General Slay particularly who led the charge last year and got the first two multiyear procurements driven through our bureaucracy. It didn't come easy but we are buying our 30 mm ammunition and we are buying a piece of electronic equipment at savings that range between 10 and 20 percent. So that sort of set the tone.

Then I think General Slay's presentations to both houses on this subject caught people's imagination and that thing has been picked up. We are ready to move out very, very quickly with that. We are active in formal negotiations under way in many programs, most notably the F-16, as to how we can restructure them for multiyear procurement as soon as we get the green light. There is legislation pending in the Congress and it seems to be receiving favorable reception to allow that.

We would be prepared to move out with virtually any program that reached a stable point. That is where we know about how many we are going to buy and we settle down and think it is time to move. I think the savings will run between 10 and 20 percent in those cases. In regard to the pursuit of technology to an inordinate degree, certainly the Department of Defense and the Department of the Air Force have been guilty of that. It is not true I don't think in every case, and not even in the majority of cases, but from time to time we go too far.

Yet, a balance has to be struck. We are critically dependent upon our technology and it is a great strength of America. I think all recognize we are not going to match the Soviets in numbers, we are outgunned in every measure we look at, and the offsetting edge we have is technology. But any virtue carried to extreme becomes a vice and if you do that it is the last 5 percent that can start getting you in trouble.

I had hoped we had learned from our experiences and we are a lot more cautious about that. There is one thing that we did, and I think we can see the results, but it is not apparent to everyone yet. Several years ago we instituted at Wright-Patterson AFB, our Aeronautical Systems Division, a coequal Logistics Division. Both are headed by three star generals who sit literally across the street from each other and the job of the Logistic Section is to make sure it doesn't happen, and he has equal staff for that. He has the same level of people involved in the decision process.

We have been doing that for about 5 years and I think the results will be seen in the next group of weapons that come out, say the air launch cruise missiles and the B-52 modifications. I think we will see very helpful results from that effort.

INORDINATE TECHNOLOGY SPECIFICATIONS

Senator **Rudman**. One of the criticisms levied most often against the Air Force and the Navy has been that the specifications in terms of what was needed went to a point where the last 5 or 10 percent added an inordinate amount of cost, particularly in seeking technology that had not been developed. Is that factor being considered now in your procurement program?

General **Burke**. Yes, sir, it is, and it is considered at a fairly high level. We have just taken a very critical look at the specifications we would establish for the new long-range combat aircraft and we reviewed that all of the way up to the Air Force Council. We threw out some things that we judged were too far in that direction.

Senator **Rudman**. Senator Schmitt, do you have any questions?

Senator **Schmitt**. Thank you, Mr. Chairman.

SHUTTLE LAUNCH: ROLE AND PAYLOADS

I must get over for our other markup here shortly and a few things with the staff, but General I am a little bit concerned, as you probably are aware, that we are still living a little bit in the past in terms of modernization and modernization of the forces. Although I agree with your statement that in some areas, at least virtue carried to extreme is a vice, nevertheless I do have a feeling that we haven't moved far enough toward looking at the future Air Force mission, and particularly the role that the Shuttle and Shuttle payloads and research and development, using the Shuttle as a base, may provide for the Air Force. I wonder if you could supply for the record some elaboration over the paragraph that you have in your testimony on that subject, to see if you make me have a warmer feeling than I have of the Air Force view of the future?

General **Burke**. Could we give you that in a classified form? We can put a lot more in it.

[The information follows:]

SHUTTLE BASE AND LAUNCH PAYLOAD

The military space program is an integral portion of the US national security capability. The program is worldwide both in scope and in capability to match the worldwide commitments of the forces that it supports. The Space Shuttle will become an essential element of that effort. In the near term, it will replace our expendable launch vehicles and allow us to expand the capability of our satellites because of the Shuttle's increased performance. In the longer term, the Shuttle truly opens a new era in space operations and presents great new opportunities which should enable us to enhance the DoD space program.

Our military space program derives its tasking from its unique capability to provide support not otherwise available and from its capability to provide support more economically than any terrestrially-based alternative. The growing worldwide force projection goals and interests of the Soviet Union are leading their space program into a similar situation.

(Deleted).

While the support capability of our space systems have made them valuable to us, (deleted). Further, their value is in the here and now -- not the distant future. We have existing commitments with forces deployed worldwide; we are critically dependent upon our far-flung supply lines; (deleted).

Accordingly, the objectives of the military space program rest on the following -- with emphasis on the near term capability:

- The operational imperative to continue existing operational capability without outages (e.g., communications, surveillance, navigation).
- The operationally driven requirement to expand existing capability through major (block) upgrades to existing payload designs to incorporate new technology (deleted).
- The need to test, at the subsystem level, new technologies prior to incorporation in an operationally configured system.
- The need to gain operational experience with manned space systems and use that experience to develop the next generation of space hardware.

Our early use of the Shuttle will focus on its capability as a launch vehicle. We plan to complete the transition of all of our current payloads and missions to the Shuttle by FY 87. That transition will require either modification or redesign of all of the payloads concerned. In many cases, the redesign required for Shuttle launch was incorporated into a previously planned "block change" to upgrade the system. Our major effort is, therefore, concerned with the efficient transition of these space systems to the Shuttle and the maintenance of the required mission capability during the transition period.

In concert with the primary task of transitioning the current systems to the Shuttle, we will begin using the Shuttle as a platform for man-aided experiments and subsystem testing. These missions will run the gamut from DOD-sponsored basic research to "field" testing of prototype systems.

In both the traditional payload delivery mission and the Shuttle-unique test mission, we will be gathering data useful in validating the effective use of man in space and in adapting new designs to include the most beneficial aspects of man's capability.

We have not created any unique missions for the Shuttle (other than on-orbit experimentation). We plan to use the Shuttle as it was originally conceived -- a high volume, multi-user transport. We plan to use some of the unique aspects of Shuttle capability to allow checkout of the payload prior to the payload's departure for its final operational orbit and recovery of certain payloads for refurbishment on the ground. New missions -- should they develop -- will do so gradually out of the experience gained in the early operations.

We are studying various concepts for advanced military missions using the Shuttle (deleted).

We want to emphasize that these are concepts only -- we are not proposing fielding any of the concepts, yet.

It is also important to understand the risks inherent in our approach as well as the benefits. With or without the Shuttle, the US military space program faces the following risks:

- Loss of existing capability through failure to provide adequate redundancy or robustness of current systems.
- Inability to quickly replace or backup key elements of existing systems lost either through natural disaster, normal wear out of on-orbit systems, or enemy action.
- Loss of technological lead in key areas which, if fielded by the Soviets, would threaten our space infrastructure.
- Inability to deter, defend, or retaliate effectively against actions hostile to our space infrastructure.

The Shuttle offers increased payload capability with potential to improve the reliability, redundancy, and rapid replacement of existing systems. The Shuttle, itself, is a significant technological achievement and will, hopefully, aid in the rapid expansion of our technological lead in space-related technology areas.

(Deleted).

Further, to DOD the Shuttle is a means to an end -- the operation of the payload in space. The funds expended on the Shuttle program (greater than those required for unmanned systems) constitute a "drain" on resources which might otherwise be expended to improve or expand payload capabilities. Exploitation of the unique capabilities of the Shuttle requires a significant investment from the payload. We recognize that these investments are necessary; but, they do represent a significant opportunity cost.

On balance, we view the Shuttle as an, as yet, unproven vehicle of great promise. That promise lies in the Shuttle's ability to expand the DOD space program beyond its current bounds using the unique capabilities of the Orbiter. Such an expansion requires an accurate understanding of the Shuttle's capabilities and the time to create the payloads which can take maximum advantage of the benefits and minimize the effects of the limitations. We have, therefore, been participating in the early test and operation of the Shuttle to gain experience with the Shuttle and to obtain the data which can be used for future payload design.

Until we gain sufficient experience and confidence with the Shuttle, our approach to the transition of the current payloads to the Shuttle must be conservative. We believe that such an approach is both logical and valid given:

- The operational imperative to continue the existing capability without interruption.
- The desire for an evolutionary growth of existing capability.
- The need for operational experience with the Shuttle.

Once we gain that experience and confidence we look forward to a rapidly accelerating exploitation of the unique Shuttle capabilities.

The Shuttle will lead to a major expansion in our National ability to operate effectively in the space medium. We expect it to open a new era in space operations; it will stimulate new ideas for meeting our defense needs and present new opportunities which should result in an even greater contribution by our military space systems to maintaining the United States as a free nation.

CONSOLIDATED SPACE OPERATIONS CENTER

Senator SCHMITT. Yes, and included with that, if you would, a somewhat more expanded discussion of the role of the Consolidated Space Operation Center and particularly its functions other than those of backup or redundancy to the existing capability, both what you have in satellite control facility upgraded and the NASA facilities which are also in the process of being upgraded to handle Air Force related missions.

General BURKE. Yes.

[The material follows:]

ROLE AND FUNCTIONS OF CSOC

The Consolidated Space Operations Center (CSOC) will be part of our overall space control architecture. The nonnuclear survivability afforded by elimination of reliance on single critical nodes is very significant. In addition, there are a number of other contributions that CSOC will make in the satellite and Shuttle control area.

Our satellite operations are conducted from either the common user Satellite Control Facility (SCF) or from dedicated ground stations. The SCF is utilized when the satellite program needs global coverage and can use the time shared network. Dedicated facilities are used for programs like the Defense Support Program when continuous data readout is required. When CSOC is available, primary control center responsibility for the SCF supported programs will be assigned to either the CSOC or the Satellite Test Center (STC). CSOC and STC would also be assigned contingency support responsibilities so that critical satellite maintenance functions could be assumed at another control facility in the net. The distribution of missions between CSOC and STC will be based on the satellite orbits, mission criticality, and schedules for deployment and/or block change in the mid 1980s. This dual node architecture increases the capacity and operational flexibility of our satellite control.

For Shuttle control we intend to use Johnson Space Center (JSC) as a learning tool. The interim Controlled Mode configuration at JSC will allow DOD to conduct missions at the SECRET level but there are limitations in capacity and operational capabilities. The CSOC will allow DOD to conduct operations at the TOP SECRET level at a secure site (vice the open NASA facilities at JSC). We will be afforded direct control of DOD missions and eliminate the need for NASA involvement in the direct military exploitation of the Shuttle. Further, the close interaction between the Shuttle and satellite control function will be greatly enhanced by their collocation in the CSOC. These interactions are particularly important during payload retrieval missions and during sortie missions in which the Shuttle orbiter acts as a mission platform. In this latter role the security, operational flexibility and military control of the mission are perhaps most significant.

The consolidation of space control functions in the CSOC offers other benefits. Cost avoidance is realized through shared overhead and support functions. The effectiveness of the interfaces with the Space Defense Operations Center (SPADOC) are enhanced. The CSOC also will provide a focus for the evolution of Air Force Space operations in the future.

Senator SCHMITT. One of the main areas that I have concern about, Mr. Chairman, as we discussed yesterday, was whether the Air Force is looking far enough ahead in terms of the potential for antimissile defense systems, building toward a different capacity 10 or 15 years from now than we have today. I will submit a classified question along that line if I may, and if it could be answered.

General BURKE. YES.

Senator SCHMITT. Thank you, Mr. Chairman.

Senator RUDMAN. I will join you with that markup as soon as I am relieved here. I think now I would like to go into some specific questions concerning the procurement itself. We were able to get into some of these briefly yesterday with the Secretary and the Chief but perhaps you might be able to give us more detail. If, of course, any of these questions require classified answers we can defer them and go into a classified closed session at the close of the hearing.

AIRLIFT CAPABILITY

I want to talk about the C-X program because obviously that particular program for a new airlift capability could be of enormous expense. There has been some testing recently and some results to indicate that the C-5A has some qualities that were really not built into the spec, which is rather a change, that it can operate out of shorter fields and narrower fields and rougher fields and so forth. Are we looking very closely at that as an alterntive to go to a whole new aircraft procurement program?

General BURKE. Yes, indeed, if I could just take a couple of minutes and put all of the airlift pieces in one package.

Senator RUDMAN. I wish you would.

General BURKE. First, there doesn't seem to be any disagreement in the Department of Defense that the country desperately needs more airlift. All of the exercises and all of the studies would support that proposition. I would say it is also important that you are able to move outsize cargo which is the muscle and firepower of today's army, and it is very desirable if you can land at other than one or two large airfields. So first we are trying to do this in line with the point I made earlier about doing all we can with what we have already.

What we are doing there is the big buy, the increase in spares, a lot of that is associated with airlift so we are going to be able to fly these airplanes up to their designed capability.

The second thing we are doing is we are stretching the C-141 and that gives us a little extra volume. Then we are rewinging the C-5 to get another 30,000 flight hours out of it.

The second area that we are trying to work is the Civil Reserve Air Fleet, which is the cheapest way. We have not been very successful in that. There we pay an airline which is buying a new airplane, a sum of money and he puts in a stronger floor than he otherwise would and he makes it available to us. That is the cheapest way to get airlift. But the airlines haven't been buying airplanes; so we are requesting that we be exempted from the requirement that we do that only with new airplanes and consider doing it with airplanes already in service, but that is a kind of an unknown at this time.

The third area I will just generally call new airlift, over and above what I just described, and there we have two programs. We have the C-X program which considers the development of a brand new airplane, something in the order of 450,000 pounds, that could carry outsize cargo over intercontinental ranges and into small fields. We are in a source selection with Boeing, McDonnell Douglas, and Lockheed, all having proposed designs to do that job. Out of that we will, of course, develop competitively derived, contractually binding numbers. Currently we have another program that we will call the alternative airlift proposal in which we went to the same three companies, the only three that make airlifters, and asked them what they would recommend to us, an imaginative and innovative way to provide cheaper airlift. We have proposals from Boeing, Lockheed, and McDonnell-Douglas; and the Lockheed proposal is the C-5.

What we wanted to do was go through the source selection and see what a C-X would cost and what would it do for you in numbers that we had high confidence in. Then you take the best of that and compare it to these alternatives; it might suggest to buy some C-X and some of this other plane. If you don't buy any C-X, you may buy some alternative. That is the position we are working from.

C-X SPECIFICATIONS

Senator RUDMAN. That is a classic case where I would assume at the end of the program you outline, that the C-X would meet all of the specifications and be the airplane for the job. Yet the differential in cost between that and something that met most of the specs, such as a modified C-5 or converted civilian machine, might not meet all of the specs but might be appreciably less, and that is something we don't know.

General BURKE. That is why it is not all one competition, because you do have to have specs for the C-X. But you pick the best of those, when you don't have specs, and it is a matter of judgment. Obviously the C-X is going to do things the others won't, and so you have to apply subjective judgment to that quality and trade that off against the others, which certainly you are going to get cheaper and you are going to get quicker.

C-X SOURCE SELECTION

Senator RUDMAN. When do you expect to have data from these options to make a recommendation?

General BURKE. The source selections are to be completed at the end of June and very shortly after that we could do that, and then I think obviously it would be incumbent upon us to come back to the Congress and give you our recommendations.

Senator RUDMAN. It is a very important task you have because the potential cost of that airlift capacity we all agree is needed, could be very enormous and substantial. I would like to turn now tc your appropriation requesting for the M-X.

We talked about that in a classfied closed session yesterday. I would like you just to outline specifically what the money will be used for in this appropriation.

General **Burke**. The money that you are looking at here is all research and development, 3600 money, $2.4 billion. The majority of that is in full scale engineering develpment of the M-X missile as directed by both the President and the Congress. The majority of that money is going for the development of the missile itself, the 92 inch M-X, the three stages, the guidance and reentry system and all of those attendant components of an ICBM.

A smaller amount is going into research and development associated with the basing mode, the command control and those features.

Senator **Rudman**. I guess my follow-up question is that with the exception of the work that you are doing in the basing mode, the bulk of this money would have to be spent regardless of what basing mode is finally recommended by the Secretary of Defense. Am I correct?

General **Burke**. Yes, that is true.

ALCM OPERATIONAL TEST AND EVALUATION

Senator **Rudman**. I want to talk about the ALCM, the request of $590 million in the fiscal year 1982 budget for 440 of those. That is the Boeing AGM-86B.

General **Burke**. Yes, that is right.

Senator **Rudman**. You had some fly-offs. I think 10 of them. There were some problems. Are you confident that their procurement will give you 440 ALCM's that will achieve their objective? Do you still have some reservations about the technical ability of these weapons to operate as specified?

General **Burke**. I still have some reservations about the completeness of our operational test and evaluation program. But they are not deep concerns. The competitive fly-off was for the purpose of picking a winner and a loser and I think it clearly showed us that one candidate was superior to the other. It did not leave any of us with a comfortable feeling that we had established that they would work well. Immediately after selection we then moved into the initial operational testing. That is the phase we are in right now. This is using production equipment, whereas the earlier tests were with all sorts of hand built and even jury-rigged devices.

That program got off to a not very satisfying start. Out of the first seven flights, three were failures and that is not a good track record by anybody's standards. So we stopped the test program for a while and we initiated an inquiry into that. We think we found some things that were not as they should be but we didn't find any fundamental design flaws. We resumed testing and we have had three additional tests and the missile has performed quite well. So I would say at this point we have not demonstrated to my satisfaction and not to anyone else's satisfaction, that the missile meets our expectations. On the other hand I have strong confidence that we will. I think that we need a few more flight tests to do that and

I would say comparable to other development efforts about this point in time, the project is coming along in a satisfactory way.

PRODUCTION CONCURRENCY

Senator RUDMAN. I asked the question only because one of the problems that has been associated with procurement of some of these systems over the years has been a tendency, and I think with justification, to alter the production phase of some of their equipment before the bugs are ironed out. The net result is it has been one of the most significant reasons for cost growth.

That is why I asked the question.

General BURKE. You are abolutely right. It is important to remember that the ALCM program was given substantial increased emphasis in the wake of the decision to kill the B-1. The decision was made that we would do this program and we would accept the risk. So from the beginning it has been viewed as a riskier than average program but I would think that we would pull it off reasonably well.

KC-135 REENGINING

Senator RUDMAN. I think the next item I would like to talk about is the reengining on one of your charts. There is a reengining program for the KC-135's, and I am very familiar with that program. The people in the field who operate up on our coast in New Hampshire would like to know what the plans are at this time and what the time frame is, and particularly what additional capacity will give the Armed Forces, for the record. I am familiar with it.

[The material follows:]

KC-135 REENGINE PLANS/CAPACITY INCREASE

Source selection was completed on 22 Jan 1980 and the first production aircraft Developmental Contract awarded to the Boeing Military Airplane Company. The winning engine configuration was the General Electric/SNECMA CFM 56. Phase I, which ran through March 1981, comprised the necessary design engineering and integration studies and resulted in a Critical Design Review which confirmed the feasibility for proceeding to the follow-on production phase of the program. The first production unit, or certification aircraft, will undergo modification in fiscal year 1982 and complete testing by fiscal year 3-83. Tooling for follow-on production has been ordered. Follow-on production kits will be purchased starting in fiscal year 1982. The lead time for kit delivery is 32-36 months, thus follow-on deliveries will occur in fiscal year 1985, although the Air Force is investigating a long lead business strategy which would allow deliveries in 1984. The Air Force has recently received OSD approval to begin follow-on modifications in fiscal year 1982 for the first 300 KC-135R.

A reengined KC-135, designated the KC-135R, is on the average at least as capable as 1.5 existing KC-135s. Additionally, reengining provides increased operational flexibility by eliminating the current dependence on extremely long runways. Additionally, reengining with a modern, fuel efficient engine will save large quantities of fuel and reduce the environmental difficulties—noise and particulate pollution—of the current engine. Specifically a summary of reengining justification is as follows:

(1) *Air Refueling Productivity Increase:* Offload increase (30-200 percent depending on scenario)—an average of 50 percent.

(2) *Operational Flexibility:* Operation from shorter runways (NATO, U.S. dispersal, ANG/AFRES). 130 more CONUS/171 more NATO runways are usable for KC-135 operations.

(3) *Savings of Scarce Resources:* 110,000,000-125,000,000 gallons of fuel per year (615 aircraft reengined).

(4) *Environmental:* Significantly reduces exhaust, air pollution, and noise emissions. Overseas basing problems are also reduced (e.g., Fairford, England).

(5) *Reduced O&S Costs:* Newer technology engines reduce costs (40–50 percent) and would permit a cost avoidance of a percentage of the $1.2 billion J57 rehabilitation costs required to restore the J57 engine. Reengining all KC-135As will eliminate the total requirement for the J57 rehabilitation (Pacer Grade).

General **Burke**. Reengining is a very important program and one that is badly needed from several respects. The country owns about 650 KC-135 aircraft and they are tremendously valuable to us. Although they are not new they are very sound structurally and we expect to keep them well into the 21st century. I think they are expected to last until 2025 if there is any gas to supply them.

The only deficiency the airplanes have, and this is a major deficiency, is that they have one of the original jet engines, the J57, which is noisy, dirty and tremendously inefficient in its fuel consumption. By reengining we can add badly needed refueling capability with new engines and a reengined craft is equal to one and a half aircraft. So we are adding very badly needed refueling capability. We are saving an enormous amount of fuel, 180,000 gallons per year per airplane or well over 100 million gallons for the entire force, and we are clearing up our environmental problems which are quite severe, particularly in other countries of the world.

We operate those airplanes in England for instance, and they are quick to point out that it is a noisy airplane, more than the Concorde which we declined to have land in some of our airports. So all of that is rectified. We selected from the competition last year, for the CFM 56 and the program is under way.

The French have joined with us and they have 11 of these airplanes. They have contributed their share to the research and development efforts and we will be reengining their airplanes along with ours. We are planning to build up a production rate of six a month, which matches the normal depot maintenance schedule of the KC-135.

The Air Force is committed to reengining at least 300 KC-135's and I would think that eventually we will reengine all KC-135's that we retain.

CIVILIAN 707'S

Senator **Rudman**. Knowing the limitation of that particular airplane for airlift, because of width and height and so forth, and with the huge number of civilian 707's and 707-20's that are around the country in storage by many of the airlines, is that a potential candidate for re-engining could be used as an inexpensive method to increase airlift particularly of troops and small equipment?

General **Burke**. Yes, sir, and in fact we have money in the 1981 Reagan supplemental just for that purpose. It is something I don't recall that the Air Force has ever done before but it seems to be a remarkably good opportunity for us in that the airline industry is retiring 707's because they are uneconomical. An airline will operate aircraft like that 10 hours a day and we operate it 1 hour a day, so the cost of fuel is not as significant to us. They are selling those aircraft really as distressed merchandise.

Senator **Rudman**. How much each are those aircraft selling for?

General **Burke**. The very best ones are in the order of $3½ million a copy, so we propose in the 1981 supplemental to buy seven of those aircraft, and retire seven existing airplanes. They are not tankers, but are range instrumentation aircraft. We also propose buying some additional 707's of the 123 series, the first ones. We are planning simply to take those engines off and put them on some of our own planes.

BOMBER OPTIONS

Senator **Rudman**. I think it is that kind of innovation which could save substantial sums of money and give us an increased capability. I want to talk about the B-1 and the FB-111. There seems to be some disagreement among people in the Air Force. General Ellis says that the FB-111 would cost about half as much to develop and it has limited application and yet would be ready rapidly. That it would give us a chance to continue R. & D. on the high technology equipment, the so-called stealth and so forth. That decision is going to be forthcoming, and do you have a view you would like to express this morning?

General **Burke**. I might say what it is that the Air Force agrees on, and then emphasize your point as to what the issue is. First, all of the Air Force leadership believes very strongly that we do need a long range combat aircraft. They all agree that the so-called advanced technology is extremely promising and ought to be pursued vigorously. They all agree however that the availability of that technology is such that we need a nearer term solution as well.

Then the disagreement is whether with that near term solution it is better to go ahead with the quicker and less expensive FB-111 stretch solution, which provides an airplane with much less capability than the B-1 and much less legacy than the B-1, or to go ahead and build the B-1 where we have already paid the bulk of the R. & D. bill for it and have an airplane that has capability that is likely would serve us for years. I think the majority of the Air Force favor the latter, and some of them the former.

F-15 ENGINE PROBLEMS

Senator **Rudman**. The procurement request is for 42 additional F-15's. We have had a lot of data about the F-15 and the engine problems. I believe the figures that I have looked at indicate somewhere in the order of 60 percent of the fleet is operational at any particular time due to problems. Are you confident that the problem is solved, in the new F-15's and the fix in the ones you have is going to give you what you need and are through with that particular problem?

General **Burke**. In terms of durability and reliability, I think we are out of the woods on the F100 engine or largely so. In terms of producibility that is not clear. That is whether the manufacturer is going to be able to meet its future production schedules not only for new engines but for the parts we need to service the engines that have been with us for a few years. The F-15 has done superbly. First, I think it is evident it is the best air-to-air fighter in the world, and I don't think that there is any question of that whatsoever. The problem it has had has largely been associated with inadequate buys of spare parts, and inadequate buys of support equipment. That is our fault and we should have done better. We underestimated those needs, and we had some difficulties. As you pointed out, many of the airplanes were not operationally ready.

But during the past year we took a squadron of 15's to Europe and we fully equipped them with their authorized level of spare parts, their authorized support equipment, their authorized people, and nothing else. They operated for a month in Europe and this was under peacetime conditions in which they could only fly 16 hours out of the 24. They averaged three sorties a day, and the commander estimated that under war conditions that he could have sustained six sorites a day with that aircraft.

That is by far better than anything we have done in our history, in World War II and the Korean war, where the sortie rates were one and less. It will do the job if you buy the spare parts and we are buying them.

SHORTFALL OF ENGINE SPARES

Senator **Rudman**. What is the problem with the potential shortfall of spare engine parts? Who is the manufacturer of that?

General **Burke**. That is Pratt & Whitney.

Senator **Rudman**. Is there a production problem in that particular line, that they are unable to produce the numbers that you need?

General **Burke**. They fell behind, and they had several severe strikes of major suppliers, bearing manufacturers. They fell well behind and so we wound up with some F-15's and F-16's and no engines for them. That recovery plan was developed and they and their suppliers are working to that. That has been directed by the Department of Commerce, and there has been improvement but we are not out of the woods on that particular question.

Senator **Rudman**. Is it possible that we will continue to have a fairly substantial number of these aircraft which in fact will not be flyable because of engine replacement problems?

General **Burke**. I hope not. We don't at the present time. We are about to plow some new ground and we have just enough hours on the engines that they are going to start cycling through the depot and that is going to be the proof of the pudding. We will see how many replacement parts they will need when they go through that first depot cycle.

F-100 SPARE ENGINE POOL

Senator **Rudman**. I think there is a question about whether or not you have built the pool of spare engines that you need. Have you done that?

Colonel **Uher**. There is no aircraft out in the operational inventory or any base that does not have available spare engines, should they have it removed and replaced. We took 29 F-15A's and B's, and put them down in Warner Robins and removed their engines to create a pool so we could service those new aircraft coming out of production. At the same time we did a complete set of modifications for those two aircraft and as they come out there are sufficient production engines available to equip them and to fly them to the new base.

So we don't have any aircraft on the ground today on the average, because there is not a serviceable engine. We are right close to the edge, about 21 serviceable engines.

General **BURKE**. Those are extraordinary procedures we won't want to do ordinarily.

Senator **RUDMAN**. I assume that you have engines coming off the lines at the appropriate time or else there will be rather a poor procurement policy.

General **BURKE**. That is right. We have sent a team up and we believe that we are going to make that schedule.

Senator **RUDMAN**. General Burke, if there are any developments in the next several weeks on that particular problem that would indicate in fact there could be serious problems in getting the engines in time to equip the aircraft, we would like to know about it.

General **BURKE**. I will certainly pass that on to you, sir.

AWACS

Senator **RUDMAN**. I have one more question I want to ask. If this requires a classified answer I would like you to supply it for the record. There is no need to go into a private session. I am sure that some of the members here do have some questions which we may submit to you and I want to ask a question about the three AWACS. How many have you procured to date and how many are planned to be procured in the future?

General **BURKE**. The 1982 procurement takes us through the 32d airplane, and in 1983 we propose to buy 3 more, which would take us to 35 aircraft. That is over and above the NATO request, of course, and we are putting together our 1983 and beyond budget figures right now. We are looking actively at the question of buying even more AWACS. I think the AWACS has been a tremendous success story and now in terms of crisis that deployment of AWACS seems to be the first thing that comes to everybody's mind.

Senator **RUDMAN**. Would you provide for the record whatever the scenario is for deployment of the AWACS worldwide?

General **BURKE**. Yes.

[The material follows:]

AWACS DEPLOYMENT SCENARIO

The current peacetime AWACS deployment schedule reflects the following in place forces worldwide: three E-3As at Kadena AB, Okinawa, two at Keflavik, Iceland, and four E-3As in Saudi Arabia.

The Air Force Objective Force for wartime deployment remains AWACS:

Pacific [Deleted].

Iceland [Deleted].

CONUS/Alaska [Deleted].

Persian Gulf [Deleted].

Central Europe [Deleted] (in addition to NATO AEW force).

Sustaining Base [Deleted].

PROGRAM MANAGEMENT EFFORTS

Senator **Rudman**. General Burke, you referred in your earlier testimony to a number of things that are being done within program management, within procurement and particularly looking at design specifications and how they can be more closely scrutinized to insure that we don't have specifications that eventually end up costing huge amounts of money for little return.

To the extent that this gets normalized in any documents within the Air Force, I would personally like to have copies of those documents as they go out to your program managers and to those people within your procurement sections who design these systems and decide on what procurement you are going ahead on. It is a subject which I am particularly interested in.

General **Burke**. Yes.

[The material follows:]

Scrutinizing of Design Specifications

The following document references and subparagraphs summarize the principle Office of Management and Budget, Department of Defense and Air Force policy statements provided to Program Managers to ensure specifications are tailored to specific program requirements.

OMB Circular A-109, para 7.f., "Major system acquisition management objectives". Each agency acquiring major systems should: Tailor an acquisition strategy for each program. . . ." Para 11.e., "Alternative Systems . . .," In the conceptual and less than full-scale development stages, contractors should not be restricted by detailed Government specifications and standards." DoDD 5000.1, para IV.M., "A major task of the Program Manager, following Milestone O approval, is to develop and tailor an acquisition strategy for the total program . . . technical, business and management areas shall be addressed in the strategy. . . ."

DoDD 5000.2, para IV.F.8., "Specifications and standards and a contract data list shall be identified and tailored by the contractors for application to the system proposal for full-scale development on the basis of the demonstration and validation results."

DoDD 4120.21, para III.B., "Tailoring. The process by which the individual requirements (sections, paragraphs, or sentences) of the selected specifications and standards are evaluated to determine the extent to which each requirement is most suitable for a specific materiel acquisition and the modification of these requirements, where necessary, to assure that each tailored document invoked states only the minimum needs of the Government."

Para IV.B., "The misapplication and insufficient tailoring of specifications and standards in defense acquisition programs sometimes has led to increased costs and delays in the introduction of new hardware. This can be attributed to past emphasis on achieving maximum performance without regard to cost, to the institutionalized attitude that specifications and standards were mandatory and had to be applied in their entirety, and to the lack of emphasis on the proper application and tailoring of documents to a specific need."

Para V.A., "Specifications and standards used in acquisition programs shall be selectively applied and tailored to impose the minimum essential system needs."

Para V.B., "Data requirements to be imposed in acquisition programs shall be consistent with the tailored requirements imposed by the governing specifications and standards and the policies enunciated in DoD Directive 500.19."

Para V.C., "The blanket contractual imposition of specifications and standards in acquisition programs shall be avoided and controlled to the maximum practical extent."

Para IV.E., "DoD Components shall: Establish and maintain records for each acquisition program to record the extent to which specifications, standards and Data Item Descriptions have been applied and tailored."

Para IV.F.1., "Functional technical groups who are responsible for imposing particular requirements including disciplines such as reliability, maintainability, configuration management, quality, safety, and human factors shall tailor the application of these requirements to the specific acquisition program."

Para IV.F.2., "Such tailoring must commence at the earliest possible time in the acquisition process . . ."

Para VII.A., "Review and adopt necessary revisions to internal guidance documents, such as "Program Acquisition Manuals" or "Program Management Guide, . . . to include the concept of application and tailoring of specifications and standards . . ."

Para VII.B., "Service school and training curricula should be reviewed and revised to include blocks of instructions dealing with the policies and procedures governing the application and tailoring of specifications and standards.

DoDD 4120.21, Enclosure 1, para A., "The basic process in the application and tailoring of specifications and standards to a given need involves four steps: (1) the selection from the total realm of specifications and standards of those documents that may have application to a particular acquisition program; (2) a review and evaluation of these to select the documents that have a specific application; (3) tailoring each of these documents to include only those provisions (sections, paragraphs, or sentences) required for the specific application so that each document imposes only the minimum necessary requirements in the solicitation/contract; and (4) an examination of the document requirements that survive this process to specifically tailor them to support the particular system during acquisition and life cycle ownership.

AFR 800-2, para 21., Essential military specifications and standards will be tailored to the needs of the program. (Tailoring consists of identifying and requiring contractors to comply with only those sections or individual paragraphs of an essential military specification or standard that are consistent with a program's minimum operational and support requirements.)

SUBMITTED QUESTIONS

Senator RUDMAN. I want to thank you all for being here this morning and I am sorry we didn't have more of our members here. We are marking up a number of appropriation budgets and if they do have questions I am sure that they will be getting them to you.

Thank you very much.

[The following questions were not asked at the hearing but were submitted to the Department for response subsequent to the hearing:]

QUESTIONS SUBMITTED BY SENATOR STEVENS

LIFE-CYCLE COSTS FOR B-1 VARIANT AND FB-111B/C

Senator Stevens: Compare the life-cycle costs for procurement of a stretched FB-111B/C with those of a B-1 variant aircraft such as the LRCA.

Answer: The analysis of total life cycle cost is an accurate assessment of program costs - both development/acquisition and operating/support. At the present time, these costs are not available. We are in the final preparation stages of presenting these data to Secretary Weinberger. A complete cost analysis will be available when our final report, The Joint OSD/Air Force Bomber Alternatives Final Report, is formally sent to Congress on or before 1 June 1981.

TANKER DIFFERENCES FOR BOMBER OPTIONS

Senator Stevens: Discuss the differences in tanker requirements and costs for the B-1 variant and the stretched FB-111B/C.

Answer: There are several factors which influence tanker requirements for each aircraft. Range, mission profile, force size, basing locations, and payload must all be considered.

If range is used as the main factor in calculating the tanker requirements of either aircraft, then the FB-111B/C would require more tankers since its range is approximately two-thirds that of the B-1 variant. Therefore, the FB-111B/C can be said to be more tanker dependent than the B-1 variant.

The difference in costs for the B-1 variant and the stretched FB-111B/C are not available at this time. The final configuration of the FB-111B/C and B-1 variant, as well as the associated costs and force structure, will be contained in the Congressionally-directed Joint Bomber Study to be released soon.

REPLACE FB-111's

Senator Stevens. Would the Air Force intend to replace FB-111B/Cs taken out of the Tactical Air Command, should it be decided to go with the stretched FB-111B/C as the LRCA?

What aircraft would TAC intend to procure as the replacement aircraft for the FB-111?

What would be the estimated cost of replacing the FB-111s in TAC with this aircraft?

Answer: The Tactical Air Forces (TAF) currently possess four wings of F-111s; FB-111s are Strategic Air Command (SAC) assets. One of the current proposals is to withdraw the wing of F-111Ds from the TAF inventory and convert them to stretched FB-111B/Cs for SAC.

The capability void caused by a near-term withdrawal of F-111Ds from the TAF could not be replaced. The missions they perform require aircraft having all-environment, low level and high speed penetration capabilities. An improved F-15, missionized for air-to-surface operations, has been examined as a replacement alternative and represents the capability nearest the F-111. However, the improved F-15 (deleted) and it could probably not be developed, tested, and brought to operational status before the mid to late 1980s. The withdrawal of the TAF F-111D wing would most likely (deleted). The improved F-15 could replace the returned wing for $2.9-$3.5B (FY 81$) according to a study done by Air Force Studies and Analysis.

LRCA COST GROWTH CONTROLS

Senator Stevens. When the B-1 was canceled by President Carter in 1977, one of the strong criticisms made against the B-1 was its projected cost. What preparation and planning would be initiated in the LRCA program to ensure that potential cost growth in the next bomber program will be minimized?

Answer: The Long Range Combat Aircraft (LRCA) program has been managed from the start with a charter to carefully scrutinize all costing assumptions.

Until the LRCA decision is made and the contracts have been signed, the proposed business strategy and contractual arrangements are only useful as guidelines to planning efforts.

Examples of these efforts to date chronologically:

A. Congress directed the Department of Defense to evaluate various LRCA candidatesin terms of military effectiveness and cost.

B. Throughout this evaluation process several configurations have been investigated in depth to give decision makers a better feel for how changes affect cost/effectiveness tradeoffs.

C. The Strategic Systems System Program Office sent separate Request for Proposals to the contractors soliciting a proposal for an Initial Full-Scale Development effort from the LRCA decision through configuration design and for Fixed Price contracts Not To Exceed proposals on production Lots 1 and 2 and on the FSD effort.

D. Other innovative funding efforts are being examined -- multi-year contracts, incremental funding, etc.

E. In-house efforts are looking at streamlining the acquisition process, which will have a direct impact on total program costs when inflated through the outyears. For example, efforts are being made to have the using command perform Operational Test and Evaluation on the aircraft as they are delivered to the field. A DX industrial priority rating has been staffed to reduce queuing problems for materials and industrial capacities.

From the variety of cost controls listed, you can see we are vigorously working at reducing the cost growths, a significant challenge in this inflationary era.

B-1 VARIANT SURVIVABILITY

Senator Stevens. Would the B-1 variant be more survivable than the original B-1? Why?

Answer: The B-1 variant would be more survivable than the original B-1 in a number of ways:

- The radar cross section would be reduced substantially over the original B-1 to reduce radar detection.
- The electronic countermeasures (ECM) suite aboard the B-1 variant would be upgraded to counter the latest Soviet threats,

particularly the look-down, shoot-down interceptor threat.

- The flight regime of the B-1 variant would be optimized for low altitude, high subsonic speed to enhance low-level penetration capability.

At the same time, the unrefueled range and payload capabilities of the B-1 would be increased by selective modification of the airframe and increasing the total takeoff and operating gross weight, improving its defense avoidance and degradation potential.

LRCA OPERATIONAL LIFE

Senator Stevens. How long could the stretched FB-111B/C and B-1 variant be expected to remain operational?

Answer: The remaining life of the F-111D and FB-111A is to the year 2000 and 2030 respectively, based upon a usage rate of 300 flying hours per year. The FB-111B/C, flying 515 hours per year, would last until 2020.

The original B-1 was designed for 13,500 flying hours. The B-1 Variant should operate through 2030 with a usage rate of 515 hours per year.

Once the B-1 Variant is no longer able to penetrate, it will be available for the less stressful standoff cruise missile carriage role - making its useful operational life even longer.

M-X BASING MODE MERITS AND DEMERITS

Senator Stevens: Discuss the merits and demerits of deploying the M-X missile in a vertical shelter mode at existing Minuteman fields, and supplementing it with ballistic missile defense. Do the same for deploying the M-X in shallow underwater submarine and surface ships.

Answer: It would be possible to place M-X missiles in all Titan II silos and the 400 newest Minuteman III silos. The 450 silos currently used for Minuteman II and 150 of the silos currently used for Minuteman III are not deep enough for the M-X system and, therefore, would have to be enlarged before they could accept M-X.

Although this option has been seriously considered in the past, the Department of Defense and the Congress have rejected it due to the acknowledged vulnerability of fixed silos. Such a deployment would place the M-X missile at risk. The addition of a ballistic missile defense (BMD) system might aid in this survivability problem, however, BMD of fixed silos is a difficult technical problem and would not be available until (deleted). It is considered, at best, a moderate technical and schedule risk. Current BMD systems could be overwhelmed because they would be required to defend a relatively small number of fixed locations (1052) against a large inventory of accurate Soviet weapons. Furthermore, the Soviets could deploy penetration aids to enhance the effectiveness of the attack. We should also keep in mind that effective BMD of silos (other than 200 at Grand Forks) would require either renegotiation or abrogation of our treaty with the Soviet Union.

The advantages and disadvantages of the shallow underwater submarine and surface ships concepts are currently being reviewed by the Department of Defense. The previous studies on the submarine concept are provided for the record. A December 1980 DOD summary of the submarine, surface ship, and other concepts are being provided for the record in response to Senator Stevens' request of Gen Burke for the reasons why the Air Force chose the MPS concept over all other alternatives considered.

LAND AND SEA BASED M-X OPTIONS

Senator Stevens: Discuss the land- and sea-based options for the M-X, and their strengths and weakness as they relate to:

- alert rate percentage
- command and control
- operating costs
- fast reaction time
- hard target kill capability

Answer: Land- and sea-based options for the M-X are currently under reexamination. A report is planned for this summer. The last, formal Department of Defense summary of the strengths and weaknesses of these options was published in December 1980 and is being provided for the record in answer to Senator Stevens' request of General Burke for the reasons why the Air Force chose to retain the basic MPS design over all other alternative basing modes.

MPS DESIGN

Senator Stevens: General Burke, on page II-6 of your written statement for RDT&E, you state this:

> "....the Air Force has studied various basing design alternatives for M-X which have resulted in program refinements. All of the basing alternatives studied were within the general framework of MPS concept authorized by President Carter. The conclusion of these studies is that the basic MPS design should be retained."

Can you supply for the Committee today the reasons why the Air Force chose to retain the basic MPS design over all other alternative basing modes?

General Burke: I am attaching for the record a report entitled ICBM Basing Options, A Summary of Major Studies to Define a Survivable Basing Concept for ICBMs, which provides an unclassified summary of the rationale and system evaluation considerations that led to the recommendation to deploy the M-X intercontinental ballistic missile (ICBM) in a multiple protective shelter (MPS) basing mode.

M-X TECHNICAL REFINEMENTS

Senator Stevens: What specific technical refinements have you identified which will "reduce the expense and technical complexity of the system..."

General Burke: USDRE convened a Defense Science Board Task Force in November 1979 to examine alternative design features within the framework of the general basing system approved by President Carter in September of 1979. The report issued by this Task Force recommended refinements to the design which would still retain a high degree of mobility, but would make the system simpler and less costly. The critical elements of this change were to have the erector-launcher (including the canisterized missile) separable from its transporter and to remove the automated shelter-to-shelter dash feature. This permitted a much smaller shelter and eliminated the requirement for the additional shielding vehicle. It also allowed consideration of linear connecting roads which make more efficient use of space than do ovals. This new design retained all of the mobility features of its predecessor except for the automated dash capability, but at reduced cost and complexity.

KC-135RE REFUELING DEFICIENCIES

Senator Stevens: What U.S. tanker deficiencies will remain following completion of the KC-135 re-engining program?

ANSWER: To provide refueling support to strategic bombers, tactical fighter deployments and employment , as well as strategic airlift aircraft, requires a mixed force of KC-10s and reengined KC-135s. The KC-10 is needed to provide long-range, non-stop deployment support to strategic airlift aircraft and deploying tactical fighters, particularly in those situations where third-world enroute fueling base access and overflight rights are denied to U.S. forces.

Therefore, in addition to reengining the KC-135s, the Air Force requires 60 KC-10s to eliminate the projected aerial refueling shortfall.

CRAF MOD OR NEW PRODUCTION

Senator Stevens. With respect to USAF CRAF (Civilian Reserve Air Fleet) program, what is the greater deficiency, modification of in-service aircraft to reach Air Force specifications, or production of new aircraft?

Answer: There is an overall deficiency in cargo airlift. This includes bulk, oversize and outsize requirements for both inter-theater and intra-theater movement. The CRAF enhancement program, either modification of in-service aircraft or convertible additions during initial production, is the least costly way to address the bulk and oversize inter-theater portion of that overall deficiency. The Air Force has always preferred the new production approach but that is not currently an option because US air carriers are not buying any new wide-body aircraft that are eligible for the CRAF enhancement program.

CRAF INCENTIVES

Senator Stevens. What incentives have been considered to get industry to produce more wide-bodied aircraft for CRAF purposes?

Answer: The Air Force considered an array of incentives including refundable investment tax credits, government guaranteed loans, buy-lease arrangments, tax exemptions and accelerated depreciation. After extensive discussions with potential CRAF enhancement participants, we learned that the air carriers had mixed opinions about the above incentives but they all wanted a no risk program. Thus the proposed Air Force CRAF enhancement legislation has only two incentives: (1) Authority to guarantee the resale value of the convertible aircraft and (2) authority to pay added operating costs on an annual basis in lieu of a single lump-sum payment.

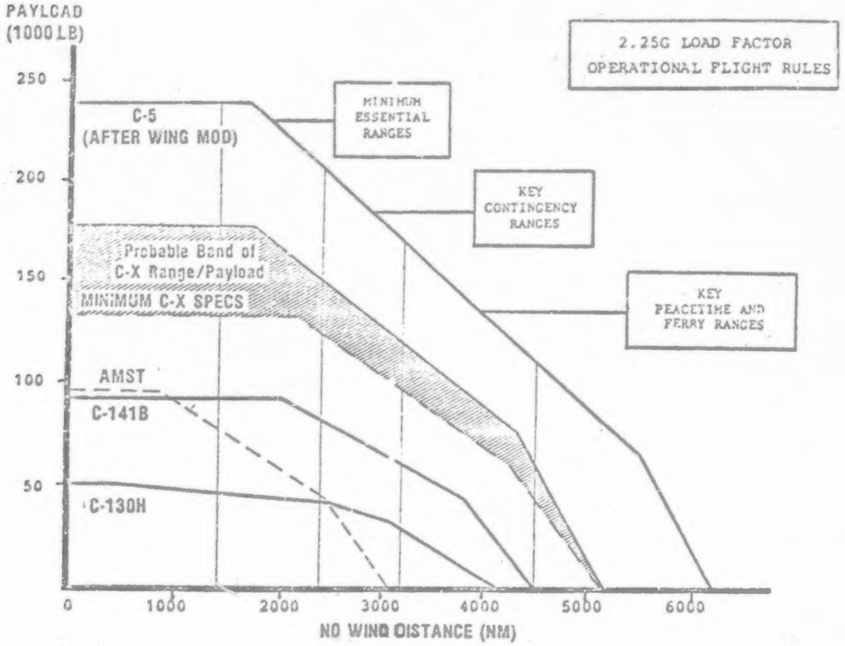
COSTS/IOC'S FOR C-5 DERIVATIVE AND C-X

Senator Stevens: The only two cargo aircraft capable of lifting outsize cargo which are now being considered for development are a C-5 derivative and the C-X.

What are the comparative projected units costs, IOCs and minimum performance characteristics for these aircraft?

Answer: The Air Force is currently evaluating these aircraft and the information requested is not available for release on the specific C-X's which have been proposed. Some generic information on the C-X and a possible C-5 derivative is available, however. The projected unit cost for the C-5 is approximately $100M-$120M and the C-X is approximately $60M to $70M. The C-5 could achieve an IOC of late 1986 or early 1987, while the C-X will have a mid-1987 IOC. The performance characteristics of the C-X and C-5 are shown on the range/ payload curves below.

PAYLOAD vs RANGE



BUDGET INFLATION FOR AIRCRAFT PROCUREMENT

Senator Stevens: The Committee received testimony yesterday from the Secretary of the Air Force and Chief of Staff of the Air force that indicated the inflation factors used in computation of the Air Force budget were provided by OMB. The Subcommittee also felt that these inflation rates were understated.

What is the inflation rate used in Aircraft Procurement for FY1982 and how much does that amount to in dollars and what is the percentage factor?

ANSWER: The inflation rate employed in the FY1982 revised budget (Reagan), using FY1981 as the base year, is 8.7%. However, the funds requested in FY1982 will actually be disbursed over a six year period (FY82-87), with only 8% of that being expended in FY1982. Consequently, the raw index of 8.7% has to be weighted to allow for the added inflation that will occur before the funds are totally expended. The weighted rate is 20.7%, yielding a corresponding dollar amount of $2,530 million for the total FY1982 Aircraft & Procurement, Air Force Appropriation.

ACTUAL FY 80/81 INFLATION IN AIRCRAFT PROCUREMENT

Senator Stevens: What has the Air Force experienced in Aircraft Procurement in FY 1980 and thus far in FY 1981 inflation?

Answer: For major aircraft systems, the rate of inflation from 1979 to 1980 averaged about 15%. Because the FY 1981 contracts have economic adjustment clauses that cover extended delivery periods, the actual rates cannot yet be determined for FY 1981. In other areas, such as replenishment spares, prices increased an average of about 20% between September 1979 and September 1980, with some selected items made from exotic, imported minerals running much higher. However, price changes are also influenced by other factors, such as changes in design and raw material content, production rate, and volume of supply, making it practically impossible to precisely quantify the amount of change caused by inflation.

PROGRAM REDUCTIONS DUE TO INFLATION

Senator Stevens: Has it been necessary in FY 1979, FY 1980 and thus far in FY 1981 for the Air Force to reduce the number of aircraft to be procured within the funds available?

If so, please provide the committee with the data relative to these reductions.

Answer: The Air Force has been forced to reduce the quantity of aircraft procured below the authorized level only once in FY 1979, FY 1980 and so far in FY 1981. The Congress authorized procurement of eight C-130Hs in FY 1980. Contract negotiations resulted in higher unit costs than had been anticipated and the FY 1980 buy was reduced to seven. Because of Congressional interest in the C-130H program the Air Force has taken action to reinstate the procurement of the eighth C-130H. Documentation providing Congressional notification of this reprogramming are being processed for submission to the Congress.

Although it has not been necessary to delete quantities of aircraft in the period mentioned, other than the one C-130H, the Air Force has been required to restructure and rephase programs to remain within the available funding depreciated by inflation which exceeded that which was anticipated.

These adjustments have included deferral of depot support equipment, training equipment, and technical data into subsequent years where they must be reprogrammed at higher costs. It has also been necessary to decrease funding provided for accomplishing Engineering Changes in the production line and to draw down management reserves or funding for anticipated economic adjustment of contracts.

TACAIR PROCUREMENT BUY OUT

Senator Stevens: The Fiscal Year 1982 budget requests contained procurement for A-10, F-15 and F-16 tactical aircraft. What is the Air Force's plan for buying out these aircraft types?

Answer: Our present plans, while still not final, reflect continued procurement of F-15s and F-16s. The A-10 buy will be completed in FY 1982. The total aircraft buy of F-15s and F-16s is as yet undetermined, but will be heavily influenced by availability of follow-on fighter aircraft and resolution of the night/all weather mission requirement.

AWACS DEPLOYMENT SCENARIO

Senator Stevens: What is the scenario for deployment of AWACS aircraft worldwide?
Answer: The current peacetime AWACS deployment schedule reflects the following in place forces worldwide: three E-3As at Kadena AB, Okinawa, two at Keflavik, Iceland, and four E-3As in Saudi Arabia.

The Air Force Objective Force for wartime deployment remains AWACS:

Pacific	(deleted)
Iceland	"
CONUS/Alaska	"
Persian Gulf	"
Central Europe	" (in addition to NATO AEW force)
Sustaining Base	"

CTA STATUS

Senator Stevens: What is the status of the B-52 companion trainer program?

Answer: The congressionally directed evaluation is about to commence. Two modified CT-39 test aircraft will be delivered to SAC by the end of May with validation flights starting in mid-June at Barksdale AFB, Louisiana. Program schedules call for release of a Request for Proposal in 4QFY81 to industry for the development and acquisition of the aircraft. RFP results should be available by the end of the current calendar year, along with the results of the evaluation. These results would then be presented to Congress for appropriate action. Given favorable test results and adequate funding, the CTA could be operational as early as FY85.

MINUTEMAN FUNDING IN FY 82

Senator Stevens. How will the $34.3 million requested for Minuteman II and III missiles be utilized?

Answer. The $34.3 million requested is exclusively for Minuteman III weapon system procurement and will complete acquisition of the new MK12A reentry vehicle. This FY 82 procurement of 102 units is the life time buy-out of flight test assets. Deployment of the MK12A is ongoing and is planned for completion on 300 Minuteman IIIs in February 1983.

ALCM PROCUREMENT OBJECTIVE

Senator Stevens. Considering the 440 Air Launched Cruise Missiles requested in the FY 1982 budget, what is the total Air Force program for procurement of Air Launched Cruise Missiles?

Answer: The total Air Launched Cruise Missile buy is 3418 missiles. The current Air Force procurement plan through FY83 is shown below:

	FY80 & Prior	FY81	FY82	FY83
Quantity	273	480	440	440

GLCM STATUS

Senator Stevens: What is the status of the Air Force Ground Launched Cruise Missile?

Answer: The Ground Launched Cruise Missile (GLCM) is in full scale development. Air Force testing of the GLCM system begins late this year and will complete in early calendar year 1983. The Initial Operational Capability (IOC) for the system is planned for the United Kingdom in December 1983.

GLCM EMPLOYMENT

Senator Stevens: How would the Air Force employ the ground-launched Cruise Missile?

Answer: The ground launched cruise missile will be deployed as a forward based complement to existing and future theater nuclear forces. The concept of operations calls for GLCM to be employed against military targets (deleted). These targets are (deleted) NATO's land-based theater nuclear systems.

SPACE PROGRAM COMPOSITION

Senator Stevens: What is included in the $891.2 million requested for Space Programs?

ANSWER: The $891.2 million requested for Space Programs as part of the FY82 Missile Procurement Budget Request includes funding for programs as follows:

Communications Security	$ 19.5 million
NAVSTAR Global Positioning System	$ 73.6 million
Space Launch Support	$ 33.6 million
Satellite Data System	$ 41.9 million
Defense Meteorological Satellite System	$ 36.9 million
Defense Support Program	$230.3 million
Defense Satellite Communications System	$129.9 million
Space Boosters	$113.2 million
Space Shuttle	$212.4 million

These subtotals do not add due to rounding.

More specific information is available in the Congressional descriptive summaries submitted for each program.

WAR RESERVE STOCK

Senator Stevens. What impact will the $2.0 billion increase in Other Procurement Air Force have on war reserve stocks?
Answer: The increases in war reserve material (WRM) stock procurements in the Other Procurement Account in FY82 over FY81 total $760.0 million. Specific increases are: munitions WRM, $609.7 million; mobility support equipment for Rapid Deployment Forces, $102.4 million; medical/dental WRM equipment, $19.0 million; and prepositioned support equipment for US forces deploying to NATO, $28.9 million.

LONG RANGE PLANS FOR WAR RESERVE STOCKS

Senator Stevens: Does the Air Force have a long-range program to fill deficiencies in war reserve stocks?

Answer: Yes, the Air Force has a long-range program to fill deficiencies in war reserve stocks. The FY 82 amended budget contains $1,312 million for the procurement of war reserve materiel. This fully funds the prepositioned requirement of $671.7M and funds 38% ($640.3M) of the other war reserve materiel (OWRM) requirement of $1,699 million. The balance of the OWRM requirement is funded by FY 86 in the five year defense program.

OFF-THE-SHELF VEHICLE PROCUREMENT

Senator Stevens: To what degree does the Air Force procure off-the-shelf vehicles?
Answer: We buy commercial, off-the-shelf vehicles to the maximum extent possible. Whenever an off-the-shelf vehicle satisfies our requirement, that's the vehicle we buy.

QUESTIONS SUBMITTED BY SENATOR HATFIELD

R&D PERFORMANCE CRITERIA MORE STRINGENT THAN COMBAT

Senator Hatfield: Military requirements and specifications are generally more stringent than necessary in actual combat situations, according to many reports. What procedures will you follow or emphasize in trying to bring RDT&E performance criteria more in line with combat realities?

Anwser: Using command requirements are stated to HQ USAF in the form of Statements of Operational Need (SONs). The SONs contain broad performance expectations which are scrubbed during the validation process. This process compares the stated performance expectations with the combat environment threat expected to be present during the initial operational life of the system. If the SON is validated, it is used as a baseline to initiate the development process. Subsequent System Operational Concepts (SOCs), or employment concepts, with more detailed operational parameters based on prototype development data and threat updates, are forwarded by the using command as the acquisition progresses. If approved, the SOCs or operational concepts, together with the updated threats, are used by the developing and testing agencies to determine if current prototype or full scale development system performance and effectiveness meet the requirement. Program adjustments are made accordingly. Final testing, usually operational test and evaluation in simulated combat environments, is used to verify operational system suitability and effectiveness.

INCREASED USE OF OFF-THE-SHELF ITEMS/COMPONENTS

Senator Hatfield. Some military sub-systems and hardware components could be bought from the civilian sector at less cost than through the DOD system of procuring items developed solely for the military user. What are the prospects for making greater use of civilian products and components in weapons system, and what are the obstacles to doing so?

Answer. DoD makes use of civilian products where appropriate, consistent with military requirement. For example, commercial test equipment is used for depot maintenance and transport aircraft use commerical equipment such as inertial navigation systems and fuel savings advisory systems. On the other hand military aircraft must operate under conditions and environments that often cannot be satisfied by commercial products.

For example, the worldwide mission of the U.S. military results in requirements for operation in a broad temperature range that cannot be met by most commerical products. Qualifying commercial parts for military application requires significant time and resources. It took over five years after introduction of a microcomputer integrated circuit before a military qualified version was available.

In an effort to apply the benefits of integrated circuits available from industry sooner and at lower cost, the DoD initiated the Very High Speed Integrated Circuit (VHSIC) program. Using the technology available in the civilian sector the VHSIC program seeks to develop military qualified integrated circuits that can continue to satisfy increasing mission performance requirements.

The DoD will continue to apply civilian products where feasible. Since civilian products often cannot meet military requirements, the DoD is taking steps such as the VHSIC program to make maximum use of the technology available from the civilian sector.

RUNWAY REPAIR DEVELOPMENTS

Senator Hatfield: The wartime survival of overseas air bases has been questioned by many defense analysts, and numerous studies on runway vulnerability problems indicate that U.S. tactical air power in Europe and Asia could be effectively grounded for critical periods of time by runway interdiction. Air Force Magazine (February 1981, p. 76) recently reported on USAF efforts to develop a "Rapid Runway Repair" capability to cope with this situation, noting that "Over the long term, the R&D effort (an estimated $60 million through FY 86) has two goals: developing faster and stronger repair techniques and materials and developing possible alternative launch and recovery surfaces for aircraft operations." What specific repair techniques and alternatives for aircraft operations are being investigated? What are the time and cost implications of these efforts:

ANSWER: The Air Force concurs that the operating surfaces of our overseas airbases are likely targets for enemy attack, and damage to runways and taxiways will cause aircraft operation delays for unacceptable periods.

The Rapid Runway Repair (RRR) research and development program is funded through Program Elements 63723F/2104 and 64708F/2621. The program has four thrusts:

1. Post Attack Environment--the means to rapidly assess airfield damage including unexploded ordnance/mines and to develop a post attack action plan.

2. Bomb Damage Repair--the materials and methods to rapidly repair craters and other weapons damage.

3. Surface Roughness Criteria--determination of the maximum runway roughness (which equates to quickest repair time) that Air Force aircraft can tolerate.

4. Alternate Surfaces--development of stabilized off-runway surfaces for rapid launch and recovery, or damage-resistant runway surfaces.

The primary goals of the RRR program are to:

1. Launch and recover (deleted) after the attack, and

2. Conduct sustained operations (deleted). Systems developed to achieve these goals must be compatible with equipment and procedures needed for the adverse environments for chemical warfare and mines/unexpected ordnance.

The current Air Force capability for RRR is to repair (deleted). This relates to the bomb-damage repair function only and (deleted) when the full range of reconnaissance and ordnance removal functions are included. Additionally, wear of chemical defense clothing can degrade repair time by (deleted). Intelligence estimates indicate airfield attack sorties can easily inflict worse damage levels than (deleted).

Specific repair techniques under investigation to complement the current AM-2 aluminum mat repairs are:

1. Crushed limestone select fill.
2. Rapid-setting polymer concretes.
3. Covers for crushed stone repairs--rubber and fiber-glass.
4. Concrete cutting devices.
5. Precast slabs.
6. Hardening for repair vehicles.
7. Asphalt hardeners.
8. Commercial equipment evaluations.

Specific actions to develop redundant surfaces for launch and recovery operations and damage resistant surfaces are:

1. Load cart testing of 4 redundant surface concepts.
2. F-4 aircraft soil-interaction tests at several sites for soft-surface computer code validation.
3. Geotechnical fabric study for soil strengthening.
4. Other soil strengthening methods to include chemicals, planks, mats, etc.
5. Expanded aircraft taxi testing on the most promising concepts.
6. Investigations of state-of-the-art materials for new runway construction to defeat conventional weapons.
7. Investigations of methods of making existing pavements more damage resistant.

RRR technology development funds are:

($M	FY 80 & PRIOR	FY 81	FY 82	FY 83 AND OUT YEARS
PE 63723F/ 2104	3.9	2.6	2.5	TBD
PE 64708F/ 2621	5.4*	4.5**	6.8	TBD

Earlier completion is possible with increased funding. Additionally, a needed program to integrate the development and acquisition programs of numerous airbase survivability activities, including RRR, is being started in May 1981. Any integration funding required, above that available in the component programs, is TBD.

*FY 80 and prior funds of $5.4M in PE 64708F, project 2054.
**FY 81 funding of $4.5M vice $4.8M due to funding reductions within the P.E.

Senator Hatfield. Programs such as the Alternate Aircraft Takeoff System (AATS), involving an air cushion platform that would allow fighters to take off from battle-damaged runways, promise take-off assistance but fail to provide for landing of aircraft in these conditions. Since landing distances are much longer than those needed for take-off, what is being done about the problem of recovering aircraft of damaged air bases? What is the current status of the AATS program? What RDT&E programs does the Air Force currently have underway in the area of vertical or short take-off and landing aircraft?

ANSWER: The Navy is currently developing for the Air Force a mobile aircraft arresting system designed to be rapidly installed on bomb-damaged runways to recover fighter aircraft. This design, and possibly alternative systems developed by private industry, will be evaluated during FY '81-'82. The selected system will be procured over FY '83-'86.

The AATS program is currently in the Exploratory Development stage at the Air Force Wright Aeronautical Laboratories' Flight Dynamics Laboratory. Funding constraints prevent moving AATS to Advanced Development prior to FY 1984.

The Flight Dynamics Laboratory has studied a variety of near-term and longer range or future design short take-off and landing (STOL) options. Some high-payoff vehicle modifications for current and future aircraft to give them short-field capability are:

NEAR TERM

- Landing Drag Chute
- Wing Flap Sequencing
- Rocket Assisted Takeoff (RATO)

'85-'90 TECHNOLOGY

- Integrated Flight/Propulsion Control
- High Lift Systems
- Large Thin Composite Wing With High Lift System
- Thrust Vectoring/Thrust Reversing Nozzle
- Guidance and Control
- Rough/Soft/High Sink Landing Gear
- Engine Modifications

The Air Force is not actively involved in vertical take-off and landing aircraft except to monitor the Navy's AV-8 program. Our Exploratory Development program in STOL aircraft is currently underway. An Advanced Development program is planned for an FY 82 start. This will be the only Air Force RDT&E STOL program.

F101X DEVELOPMENT

Senator Hatfield. The development of GE's F101X engine (derived from the powerplant originally developed for the B-1) has been viewed as a move to bring about more competition between Pratt & Whitney and GE in the production of jet engines. What are the current plans for F101X development and what aircraft are likely to be powered by this engine?

ANSWER: The need for competition in high thrust afterburning turbofan engines has been one of the objectives of the F101 Derivative Fighter Engine (DFE) program. Without an F101 DFE, there is no competition in this critical area. The $35 million for the F101 DFE in FY 82 provides for a transition to later full scale development to maintain the option of the F101 DFE as a competitive alternative. I would anticipate a full scale development decision after most of the FY 82 results are available. Possible competitive applications for the F101 DFE would include the F-16, F-14, the F-16XL, and air-to-ground derivatives of the F-15.

DOD BENEFITS FROM CIVILIAN ELECTRONICS COST REDUCTIONS

Senator Hatfield. In the civilian sector, electronic developments in recent years have resulted in a variety of lower-cost consumer goods; however, in the military sector, avionics (electronics applied to aviation) have often been cited as a major cost driver in aircraft programs. Why has DoD not been able to benefit from the cost-reduction effects of civilian electronics?

Answer. Just as in the civilian sector, DoD has benefited significantly from the major progress in electronic development. For example, the ARC-164 UHF radio which is widely used in Air Force aircraft is half the cost and has over ten times the reliability of its predecessor, the ARC-34. Similarly, the F-16 fire control computer has twice the capability at half the cost of the comparable computer in the F-106.

At the same time the DoD, in many cases, cannot directly apply commercial electronic systems. Military electronics must operate in a combat environment anywhere in the world with the result that requirements are imposed that do not apply in the civilian sector. For example, aircraft operating in the face of Soviet jamming at low penetration altitudes demand avionics that do not exist in the civilian sector. Therefore, the DoD must acquire electronics to specifications more stringent than those available in commercial applications. This results in low production runs of custom equipment with the associated increased costs.

Where those unique requirements do not apply such as in depot maintenance equipment, commercial systems are used. At the same time the DoD has initiated the Very High Speed Integrated Circuit (VHSIC) program to capitalize on commerical technology to satisfy complex military requirements while restraining cost growth. The VHSIC program will provide integrated circuits that can meet the ever increasing DoD requirements yet be produced in economical quantities.

Therefore, the DoD is taking advantage of electronic development in the civilian sector. It is this overall progress in electronic development that has permitted DoD to develop avionics at the lowest cost consistent with military requirements.

GOLD PLATED WEAPONS

Senator Hatfield: What programs or measures are used by the Air Force to prevent the development of what might be called "gold plated" weapons—weapons too sophisticated to be used reliably by Air Force personnel or too fragile to last long in battle?

Anwser: Using command requirements are stated to HQ USAF in the form of Statements of Operational Need (SONs). The SONs contain broad performance expectations which are scrubbed during the validation process. This process compares the requirement with the expected threat and identifies potential areas of risk which could inhibit the development or lead to operational support or durability problems after the system is fielded. Areas assessed include flight and maintenence crew training and supportability as well as areas of technical and operational risk. Concerns are highlighted during validation. If funded, appropriate program direction is given to the developing command, logistics and training commands, the originating operational command, and the testing agencies to insure that each concern is addressed as the acquisition progresses. Such concerns are addressed in subsequent using command System Operational Concepts (SOCs) and form the basis for design alternatives. They also are used in subsequent test plans to verify, throughout the prototype and full scale development process, the ability of field personnel to use and maintain the system effectively over extended periods of time. Initial developmental testing, operational testing and evaluation, and follow-on test and evaluation in simulated combat environments are used to verify the technical suitability as well as the operational suitability and effectiveness of the system. Throughout the development process, the test results are used to modify, as necessary, the design specifications to insure a usable and maintainable system is fielded.

STAND-OFF RANGES OF WEAPONS

Senator Hatfield: The increased range of radar detection capabilities has not generally been matched by stand-off ranges in delivery of air-to-ground munitions or ordnance. What is the current stand-off range of USAF air-to-ground weapons and how do these compare with radar ranges? What is being done to obtain greater stand-off weapon delivery capabilities?

Answer: Enemy radar detection ranges are dependent on both the size and altitude of the target. Smaller, low flying targets will be detected at much shorter ranges than a higher and/or larger target. Our prime concern with an enemy threat system is the range of the associated surface-to-air missile. While the threat's acquisition radar range is potentially greater, the range of the missile guidance/fire control radar and the missile itself is more limited and also dependent on target size and altitude.

Existing inventory weapons (and sensors) which have to cope with the enemy's radars are short range and require aircraft penetration tactics for effective employment. The GBU-15 (range [D] miles depending on release conditions) and HARM (range [D] miles depending on release conditions) are near-term improved stand-off weapons.

A conventional stand-off missile program has been established to provide a stand-off range of about 100nm and a short time to target for attacking enemy defensive systems or mobile armored targets. The missile will be compatible with either the Precision Location Strike System (PLSS) or the PAVE MOVER guidance capability.

The Medium Range Air-to-Surface Missile (MRASM) is being developed and will be employed to provide long range (300nm) stand-off also from beyond the range of enemy defenses.

Current air-to-ground weapons can, using their inherent capabilities and approved penetration tactics and delivery techniques, effectively be employed against hostile radars. Advanced, longer range air-to-ground weapons are being researched and developed.

QUESTIONS SUBMITTED BY SENATOR STENNIS

F101X ENGINE REPLACEMENT ON F-16 AND F-14

Senator Stennis. Tell me about the testing on the F101X derivative fighter engine. Funds are included in the budget amendment to initiate engineering development. Is it prudent to continue effort prior to a decision on whether to re-engine the F-16 or F-14 aircraft?

ANSWER: Both the ground and flight tests of the F101 Derivative Fighter Engine (DFE) have gone very well to date. The engine was tested to the equivalent of 1000 mission hours on the F-16 and exhibited so little wear that the same hardware is now being tested to an additional equivalent of 1000 mission hours on an F-14. The flight tests on an F-16 testbed have gone very well with stall free operation throughout the envelope. Flight tests by the Navy in an F-14 will begin in July 81. The $35 million for the F101 Derivative Fighter Engine (DFE) in FY 82 provides for a transition to full scale development to maintain the option of full scale development in FY 83 and to maintain the F101 DFE as a competitive alternative to meet mid-to-late eighties requirements. I do not believe that it would be prudent at this time to close out our options. I would anticipate a full scale development decision after most of the FY 82 results are available.

NGT STATUS

Senator Stennis: Where do we now stand on the Next Generation Trainer (NGT) program?

Answer: The Air Force has just completed an evaluation of the T-34C suitability as an alternative to the NGT. This evaluation was directed by Congress and in late May 1981, the evaluation results will be provided to the Chairmen of the Senate and House Armed Services Committees and the Chairmen of the Defense Subcommittees of the Appropriations Committees. The evaluation results find that the Next Generation Trainer is a more cost effective T-37 replacement than the T-34C. A Request for Proposal for Full Scale Development is planned for release this Fall with a subsequent contract award in early 1982.

T-34C SHORTCOMINGS

Senator Stennis: The Comptroller General recently found that the T-34C which is used by the Navy would have a number of shortcomings if selected by the Air Force. Would you please tell us why this aircraft is not acceptable to the Air Force but is the Navy's primary trainer?

Answer: There is a fundamental difference between the Air Force and Navy Undergraduate Pilot Training (UPT). This difference lies in the performance differential between the first and last aircraft flown in each program. The Navy's strike track, which most closely resembles our pilot training program, is a three phase/three aircraft system--the turboprop T-34C in the primary phase, the turbojet T-2C in the intermediate phase, and the turbojet TA-4J in the advanced phase. The Air Force, on the other hand, has a two phase/aircraft system--the turbojet T-37 in the primary phase, and the turbojet T-38 in the basic phase of pilot training. The Navy's intermediate phase T-2C provides a stepping stone from the low performance T-34C to the relatively high performance TA-4J. Air Force use of the T-34C in primary would require us to bridge the exceedingly large performance differential between it and the T-38 without the benefit of an intermediate aircraft. To effect this large transition, while attempting to maintain graduate quality standards, approximately 27 hours would have to be added to the primary phase and approximately 24 hours added to the more expensive basic phase. This extra flying time would lengthen the total UPT course, require more aircraft and additive support personnel. It would also lower our pilot production capability unless more training bases were available.

T-37 SERVICE LIFE EXTENSION

Senator Stennis: Does a service life extension program for the T-37B remain a viable option rather than development and procurement of a new aircraft?

Answer: No. While this was originally an option that was considered, extending the T-37 service life will not correct any of the aircraft operational deficiencies nor will it overcome fleet insufficiency. The development of a Next Generation Trainer will remedy existing operational constraints and will provide sufficient airframes to train the number of pilots required in the late 1980s and beyond.

ALCM DEVELOPMENT FLIGHTS

Senator Stennis. The test program on the Air Launched Cruise Missile has had a number of failures in the development flights. It is my understanding that the program has temporarily been halted. When do you anticipate the development flights will be resumed?

Answer: The Air Launched Cruise Missile developmental test flights were indeed suspended in early 1981 due to three successive mission failures. However, the test flights were resumed in March 1981, and we have since flown four missions of which three were 100% successful; and one was a partial success due to a telemetry problem (not missile related). We anticipate completion of the test program in early 1982.

GATOR TESTING STATUS

Senator Stennis. Where does the testing stand on the GATOR air-delivered mine with area denial capability? This was to be a joint development and procurement with the Marines.

Answer. GATOR Engineering Development Tests were completed in June 1980. The subsystems tested and the results are summarized below:

Subsystem	Test Successes/Total Tests	% Success
Antitank Mine (BLU-91/B)	(Deleted)	(Deleted)
Antipersonnel Mine (BLU-92/B)	"	"
Mine/Dispenser Interface (KMU-466/B)	"	"
Dispenser (SUU-66/B)	"	"

The Air Force GATOR (CBU-89/B) combined DT&E/IOT&E (Development Test and Evaluation/Initial Operational Test and Evaluation) began on 27 Jan 1981. DT&E test results to date are shown below:

Flight Test	Date	Result
KMU-466/B Performance (Mine/dispenser interface)	27 Jan 81	Success
SUU-66/B Fuze Timing (Dispenser)	15/16 Apr 81	Success
CBU-89/B Test (Dispenser proximity fuze, safing & arming, battery initiation, and self-destruct test)	17 Apr 81	Failure*

* Dispenser arming lanyard failed to arm the dispenser proximity fuze. Therefore data on fuze function and mine function was not obtained. The next CBU-89/B test (with an improved dispenser arming lanyard) is scheduled for early Jun 1981.

Captive carriage flights on the A-10 and a maintenance demonstration are scheduled for late in May. The combined GATOR DT&E/IOT&E is scheduled for completion in Aug 1981, except for the initial evaluation of GATOR service life which is expected to be available in Nov 1981.

The Navy GATOR (CBU-78/B) began Development Testing in Mar 1981 with a successful ballistic flight test at the Naval Weapon Center. Navy Gator Operational Tests tests are scheduled to begin in May 1981 and end in Aug 1981. With the exception of dispenser size and number of mines per dispenser, Navy GATOR is identical to Air Force GATOR.

GAO FINDINGS ON MOD KIT PROCUREMENT

Senator Stennis: The Comptroller General recently expressed concern that the Air Force continues to procure new items for modification kits from contractors rather than surveying the DoD supply system for these items. Why is this? It would appear substantial savings could be effected from implementation of the GAO recommendations.

The GAO report indicates it is Air Force policy that DoD resources be screened but, in practice, it is rarely done. Why?

ANSWER: It is Air Force policy to survey the DoD supply system for modification kit items prior to allowing contractors to provide these assets. DoD assets are to be used when savings can be realized and there are no unreasonable delays in completion of urgent safety or mission essential modifications to aircraft and missiles. Headquarters Air Force Logistics Command, through their Air Logistics Centers, is placing added emphasis on the Air Force policy to first screen DoD supply sources. In addition, the Defense Logistics Agency has notified the Air Force that they are ready to assist the Air Force in improving the screening of the DoD supply system for modification kit items and implementing the GAO recommendations.

As the GAO noted, although Air Force policy existed to screen DoD resources for modification kit items, additional clarity was needed in the regulatory guidance. Air Force Logistics Command submitted changes to Air Force Manual 67-1, the principal Air Force supply guidance, to clarify policy and highlight the need to screen DoD supply sources for timely delivery of required items prior to allowing contractors to provide these items. These changes will be included in the next update to AFM 67-1.

NASA WITHDRAWAL FROM IUS

Senator Stennis: Just what is the NASA withdrawal from the Inertial Upper Stage (IUS) project going to do to the Air Force program? Surely it is going to provide for increased cost. Is it also going to delay the program?

Answer: The full effects of the NASA withdrawal from the Inertial Upper Stage (IUS) program are still being assessed by our IUS program office. The preliminary indication is that this will increase DOD and NASA costs for near term work on IUS development, production, and the related integration and launch operations activities by approximately $145M; $82M of this impact is expected to be in the DOD budget. These estimates are based purely upon the reallocation of overhead and the increased overhead rates that result from reducing the planned workload at the Boeing Aerospace Company. The NASA withdrawal will also have other more subtle, but perhaps equally important, effects. For example, we must now renegotiate the IUS development contract with the Boeing Aerospace Company; this contract had been "capped" following an earlier overrun in order to limit the Government's liability for the development work then on the contract. We may be forced to recognize a significant portion of the current cost increase claimed by the Boeing Company in order to renegotiate the IUS full scale development contract. We will also face a significant stretchout of the follow-on IUS production activities and probably incur program costs beyond those resulting simply from the reallocation of overhead mentioned previously. We have an analysis underway for restructuring the IUS program and we will advise the Congress of the results of that effort as soon as it can be completed.

SPACE LAUNCH PAYLOAD

Senator Stennis: How do you feel about NASA going to development of a CENTAUR upper stage with approximately a 14,000 payload capability to synchronous orbit versus the 5,000 pounds for IUS? Do you believe Air Force programs will require this additional capability?

Answer: We have accepted the NASA decision as necessary to meet their planetary mission requirements. The Inertial Upper Stage is being developed to meet a 5,000 lb capability to geosynchronous orbit and our current performance projections indicate that we will meet or exceed that requirement. This requirement was established following a thorough validation phase which considered the needs of all DOD space programs through the 1980s. We have a number of spacecraft which are projected to fly at or very near 5,000 lbs. No DOD program is currently projecting a requirement for more than 5,000 lbs during the 1980s. However, our experience indicates that spacecraft tend to grow in size and weight so that greater lift capability will ultimately be valuable to the DOD.

ALCA/ARIA

Senator Stennis: The supplemental request contains $61 million for the purchase of used 707 aircraft. These aircraft would be used for several missions such as M-X Airborne Launch Control Center aircraft and Advanced Range Instrumentation aircraft. Is not this the type missions that could be performed by EC-135 aircraft?

Answer: EC-135N aircraft are performing current range missions as Advanced Range Instrumentation Aircraft (ARIA). However, these present EC-135N aircraft used as instrumentation platforms on the test ranges will be unable to meet range and loiter requirements for M-X, ALCM, and TRIDENT test support. Studies have shown it will be less costly to procure and modify the 707s than to perform a necessary reengining on the EC-135Ns. The 707s will also provide a greatly increased on-station time, improved fuel efficiency, and additional basing flexibility. In the M-X Airborne Launch Control Center (ALCC) role the 707s also offer attractive performance advantages. The M-X (ALCC) will be the primary command, control, and communications link between the National Command Authority and the weapon system during the trans-and post-attack time period, and a fleet of dedicated M-X ALCC aircraft will be required to provide viability to this link. Current world-wide airborne command post EC-135 assets cannot support the assigned Single Integrated Operational Plan mission requirements and also meet the M-X requirement. Overall, the 707 procurement package offers an assured supply of enhanced capability aircraft at a substantial cost savings.

C-135 REENGINE VS USED 707s

Senator Stennis: Since the Air Force is pursuing the reengining of the C-135 fleet, why cannot these aircraft be used rather than procuring the used 707 aircraft?

Answer: The Air Force is currently pursuing reengining of the KC-135 tanker force aircraft to meet the mid-to-late 80s refueling requirement. This reengining program excludes the non-tanker - 135 series airplanes at this time. The KC-135s can not be used for other than tanker missions since there is an existing and growing shortfall in total air refueling capability.

The used Boeing 707 aircraft are being purchased for limited applications within the overall C-135 series force structure. For example, of the seven aircraft being bought, one will be used as a testbed aircraft for the M-X Airborne Launch Control Center development. The others would be used to replace the current C-135 Advanced Range Instrumentation Aircraft (ARIA) which are limited in both range and endurance.

F-5 BUY

Senator Stennis: What is the justification for the procurement of the three F-5 aircraft in the fiscal year 1982 budget amendment? Advance Procurement funding is included in the supplemental.

Answer: The last aggressor squadron F-5 was delivered to the Air Force in FY 77. Since that time attrition (historically two F-5s per year) has reduced the F-5 force to the point where it is affecting the aggressor squadron's capability to perform their mission. The Air Force needs to procure the three F-5 aircraft requested in the FY 82 budget amendment to replace aggressor squadron aircraft lost by attrition.

REENGINING C-135s AND KC-135s

QUESTION: Senator Stennis. Please clarify the USAF intent relative to the proposed purchase of used 707 aircraft. The Air Force stated an intent to procure used 707-320's as replacement aircraft for special purpose C-135s.

--Is it the Air Force intent to reengine KC-135 aircraft with used JT3D engines from these aircraft?

--Recognizing that the JT3D's provide some degree of improvement over the J57 in power, how does it compare to the CFM56 in terms of power and in environmental factors of noise, pollution and fuel consumption?

ANSWER: The Air Force is implementing the CFM-56 program as a primary solution to our tanker aircraft shortfall. We are also evaluating the use of used commercial JT3D engines on a portion of the KC-135 fleet as an interim solution and as a means to avoid some of the very high costs of operating and maintaining the present KC-135 engines. No decision has yet been reached to reengine any KC-135 aircraft with JT3Ds. The money requested in the FY 81 Supplement will begin JT3D reengining of 18 special purpose -135 aircraft, such as EC/RC-135s. The JT3D turbofan engine produces a 30% increase in thrust over the J57 engine (18,000 lbs vs 13,750 lbs, wet). The CFM56 produces 22,000 lbs of thrust, providing a 60% increase over the J57 and a 22% increase over the JT3D.

Fuel consumption comparisions: the CFM56 will produce a 25% reduction in fuel consumption when compared with the J57 engine. The JT3D engine will produce an estimated 11-14% fuel improvement over the J57 engine. In the area of noise and pollution, the CFM56 engine meets the Federal Aviation Regulation (FAR) Part 36 noise and pollution levels (effective 1 January 1985). The JT3D will not meet this FAR requirement but will reduce the -135s perceived noise level approximately 60% (126dB to 111.5dB) when used to replace the J57 engine.

QUESTIONS SUBMITTED BY SENATOR ARMSTRONG

INVESTMENT IN TACTICAL COMMAND AND CONTROL

Question: Please provide to this Committee a complete overview of the Air Force investment in Tactical Command and Control. How has this investment kept pace with the rapidly expanding Soviet threat and what approach has the Air Force taken in documenting their expenditure plans for the future?

Answer: The Air Force investment in Tactical Command and Control is centered on the Tactical Air Control System (TACS). The TACS is a composite of ground and airborne command/coordination centers, ground and airborne radar systems and extensive communications systems to provide connectivity between these facilities and the forces engaged in tactical air operations. The TACS, as currently configured, has evolved over the past twenty-five years with incremental development and improvement efforts directed at the various facilities. For example, the 407L program in the 1965-1968 timeframe provided new operations centers, improved communications equipment and automated some of the air surveillance and control functions. The current ground radar, the AN/TPS-43E, was procured in the 1976-1978 period, and the E-3A, the greatest tactical C^2 enhancement, became operational in 1977. Although improvements have been made to the overall TACS, it has not kept pace with the Soviet threat in some areas. The Tactical Air Force Integrated Information System (TAFIIS) Master Plan has documented over 100 near-term, mid-term and long-term needs related to Tactical Command, Control and Communications. The TAFIIS supports the development of the C^3 expenditure plan which is reflected in the annual programming, planning and budgeting cycle and the Five Year Defense Plan. We have development programs underway to correct some deficiencies. Current programs will provide some jam-resistant communications, automation and other improvements to the forward radar elements, improved communications for terminal tactical air control assets and protection for our tactical ground radars against antiradiation missiles. In our budgeting cycles we are attempting to obtain lighter, modular equipment for the ground elements that will require less airlift and have increased survivability and mobility.

CURRENT TACTICAL COMMAND AND CONTROL SYSTEM

Question: When was the current Tactical Command and Control System developed and how adequately does this system perform today in meeting current and future requirements? Please provide this committee any operational or logistical concerns the Air Force may have in conjunction with the current 407L/485L system.

Answer: The current 407L tactical command and control system was developed during the 1965-1968 period. Except for documented system deficiencies and desired improvements to enhance system capabilities, it is capable of meeting the C^2 requirements of the Tactical Air Force commander. Operationally, additional automation is required at the forward radar elements and at the force management levels. Mobility, flexibility and survivability must be improved through the development of modular elements which will require less airlift, can be dispersed and can be incrementally deployed depending on the size of the operation. From a logistics standpoint, the inflatable shelters used at some units are beginning to deteriorate from age and frequent tear down and set up. Additionally, some of the communications equipment is not state of the art, does not provide the desired reliability, and is becoming logistically unsupportable.

NEEDED IMPROVEMENTS FOR TACS

Question: What is the current state of needed improvements for the Air Force Tactical Air Control System (TACS)? Have these required projects been funded adequately in the past and how much has the Air Force requested for FY '82? How does the Air Force plan to meet these needed improvements beyond FY '82?

Answer: Programs to improve the TACS are in every stage of acquisition from requirements definition through production. The Modular Control Element (MCE) which will provide greater survivability, mobility, automation, and interoperability for TACS elements is in the requirements definition stage: a statement of need (SON) for this capability is under review by the Air Staff. At the same time, the MCE program as well as the Ultra-low Sidelobe Antenna (ULSA), ARM Alarm Sensor, ARM Decoy, Computer-Assisted Force Management System (CAFMS), and System Trainer and Exercise Module (STEM) programs are competing either for initial program funds or for additional production funds. Two of these programs, ULSA and STEM, already have some production money and one program, the TPB-1C Ground-Directed Bombing System, will complete its production run with a contract currently in negotiation. Other programs which will benefit the TACS, but that have wider applications throughout the DOD, such as Tri-Tac, HAVE QUICK, SEEK TALK, and JTIDS are independent of TACS improvements and are also in various stages of acquisition. Not all the requests for funding for these programs have been honored because they all must compete against other vitally needed programs. FY82 is a lean year in the TACS Improvements program with only $1.2M in R&D money (ULSA) and $8.9M in procurement money(STEM). We are anticipating that an improved budget environment and greater emphasis on tactical command and control will assist us to fund improvements to the TACS in the years beyond FY82.

TACTICAL AIR CONTROL SYSTEM PRIORITIES

Question. Please provide this committee with the Air Force listing of priorities for the Tactical Air Control System improvement program.

Answer. "Tactical Air Control System Improvements" is only a portion of the programs underway to improve tactical air command and control. This title covers only those programs authorized under the 485L Program to improve the mobile TACS and does not include CONSTANT WATCH in Korea, which is improving the jointly operated Korean Tactical Air Control System, and EIFEL/DISTEL, which is doing similar improvements to the NATO Central Region Allied Tactical Operations Centers.

There is no single list in priority order of projects and programs to improve the Tactical Air Control System (TACS). Each of the tactical commands--TAC, PACAF, and USAFE--expresses its priorities in its annual submission. These lists do not coincide since they reflect the respective commands' assessments of their own needs. There is a Tactical Air Forces (TAF) Required Operational Capability/Statement of Need (ROC/SON) priority list on which the TAFs have consulted and are in agreement. However, this list reflects only ROCs and SONs and does not include those projects which are not backed by such a document. The Tactical Air Forces Integrated Information System (TAFIIS) Master Plan, updated annually by the Tactical Air Forces Interoperability Group, is the single source document of tactical command and control needs, goals, and priorities. It is a nine volume plan: Volume VI describes TAF priorities for capabilities, Vol VII describes program and project alternatives to meet these priorities, and Volumes VIII and IX present a time-phased plan and a time-phased program respectively for achieving TAC C2 goals. It does not list programs in priority order, but rather data needs. The only informative list of programs for improving the TACS is the list of those programs which survive the Air Force POM process and OSD and Administration review, are included in the FYDP, and which reflect the corporate judgment of the programs that most deserve funding.

Within the narrow confines of the TACS Improvements Program (485L), these programs have been prioritized by the tactical commands.

1. Modular Control Element (MCE)
2. Computer Assisted Force Management System (CAFMS)
3. Ultra Low Sidelobe Antenna (ULSA)
4. Anti-Radiation Missile (ARM) Alarm
5. Arm Decoy
6. System Trainer and Exercise Module (STEM)
7. Multi-Band Beacon

REQUIREMENTS DOCUMENTED

Question: Has the Air Force documented specific requirements for Tactical Command and Control in a Required Operational Capability (ROC) or in various Tactical Air Force Statements of Need (SON)? If so, please provide this data.

Answer: Yes. The Tactical Air Forces have more than 20 Air Force-validated requirements documents (ROCs or SONs) pertaining to tactical command and control. Requirements range from jam resistant communications and improved data distribution systems to improvements to the facilities that make up the Tactical Air Control System.

COMPARISON STUDY OF CANDIDATE SYSTEMS

Question: Has the Air Force conducted a comparison study of candidate systems and their capabilities and found a preferred solution to meeting necessary improvements?

Answer: Yes. In May 1980, Headquarters Air Force tasked Air Force Systems Command and Tactical Air Command to study and evaluate on-going programs as candidates to satisfy the Forward Air Control Post program requirement. The criterion used to evaluate the candidates was to be that set forth in the Tactical Air Forces (TAF) Preferred Solution to the Forward Air Control Post requirement. The commands reported their findings in August 1980. To be a candidate for this study, programs had to meet the following conditions:

a. Be under contract for development or production or provided as a deliverable end product to a designated customer; and

b. Be suitable for a tactical, mobile land-based command and control system employed in a Forward Air Control Post application.

Three systems met the study criteria. When these systems were evaluated against the characteristics/criterion of the TAF Preferred Solution, the Marine Corps TAOC-85 System was judged to be most capable of meeting the overall requirement for an improved Forward Air Control Post.

TACS IMPROVEMENT PROGRAM OBJECTIVES IDENTIFIED

Question: How has the Air Force Systems Command (AFSC) identified ways to accomplish the Tactical Air Control System Improvement (TACSI) program objectives?

Answer: AFSC is developing several evolutionary improvements to the Tactical Air Control System (TACS) which will significantly enhance system effectiveness. An Ultra Low Sidelobe Antenna (ULSA) improvement to the AN/TPS-43E radar system is in full scale development. This improvement will significantly reduce system vulnerability to electronic countermeasures. Development of a System Trainer and Exercise Module (STEM) to improve training of operations personnel, and development of a Computer Assisted Force Management System (CAFMS) to automate Air Task Order preparation and distribution are also well under way. Other ongoing developments associated with the TACS include the Netted Telephone Radio Interface Device (NTRID) which will allow netting of a number of secure voice subscribers to improve airspace coordination and control, and the Dual Band Radar Beacon which will improve close air support.

AFSC has also planned development of additional TACS improvements to enhance system survivability. Development of Anti-radiation Missile (ARM) Alarms and ARM Decoys are planned to counter the ARM threat. Acquisition of a Modular Control Element (MCE) is also planned to replace obsolete, manpower intensive equipment, automate command and control of the tactical surveillance function and improve system survivability and mobility.

TACTICAL AIR SURVEILLANCE AND CONTROL MISSION

Question: How would the timely development and deployment of an improved Tactical Air Surveillance and Control System (TACS) to the NATO Central Front significantly enhance the US capabilities to deter and effectively repel, if necessary, the Warsaw Pact threat? Could continued deferment of these validated TAF needs adversely impact our tactical Air Surveillance and Control mission on the NATO Central Region?

Answer: Part I: The smallest and most mobile unit of the current system is manual, requires large amounts of airlift for inter- and intra- theater moves, contains no automated E-3A or allied system interface and is not expandable, i.e. increased capability is only possible by the addition of multiple complete units. An improved TACS system (The Modular Control Element or MCE) as validated by the TAF will include greater mobility/rapid deployment, flexibility and control capacity, will reduce airlift requirements and has no central nodal point (permitting greater dispersal and enhanced survivability). The MCE is modular in concept, allowing a more realistic approach to tailoring the necessary equipment to the specific task. Each element will possess an automated capability within each module permitting multiple interfaces with all US services and the E-3A as well as the automated NATO and Korean command and control systems.

Part II: Yes. NATO has come to rely very heavily on the U.S. TACS system because of its capability and mobility. NATO continues to improve their command and control through internetting of automated systems and the procurement of AWACS through the NATO E-3A program. It is imperative that all of the U.S. command and control elements be interoperable with these systems.

O&M FINDS FOR 477L/485L

Question. How much has the Air Force requested in FY '82 for overall operations and maintenance for 407L/485L Tactical Command and Control System?
Answer. 31.0 Million Dollars

Describe Deployment to Saudi Arabia

Question: Please provide to this Committee the details involving the recent Air Force Command and Control experience involving the deployment of AWACS to Saudi Arabia. What problems, if any, did the Air Force experience in meeting their ground based command and control requirements in this action? What would be the capability of TAC to simultaneously deploy multiple Command and Control Systems in support of AWACS in multiple contingency scenarios over and above a deployment to Saudi Arabia?

Answer: In response to the Saudi Arabian request for assistance, the USAF deployed four E-3A (AWACS) aircraft, a mobile ground radar, a Message Processing Center (MPC), and an array of supporting communications equipment to enhance the existing air defense system. The concept of operations was to integrate AWACS and ground based radar air surveillance data into the Saudi Arabian command and control facilities. The integration of the AWACS data, as well as available data from the US Navy, was accomplished in near real time via tactical data link to the MPC. The ground based radar data, however, could not be integrated in near real time because of the lack of a tactical data link capability. Consequently, the voice product from the manual ground radar unit degraded the capability to provide the integration of data, in near real time, to the decision makers in the command and control facilities. The capability of the Modular Control Element (MCE) would permit a full interface of near real time data from all radar elements of the ground based command and control system. The capability to simultaneously support multiple contingency scenarios is limited by the number of MPC's. USAF assets total eight; however, commitments to Korea, the European Central Region, and Saudi Arabia reduces the number of contingency available MPC's to two. As a result, any requirements beyond an additional limited scenario could not be supported by TAC.

COMPATIBILITY WITH SYSTEMS OF OTHER SERVICES

Question: Does the Air Force believe that a Command and Control system should be compatible in as many ways possible with existing and future systems of the other service? How would this approach lead to improved interoperability, a reduction in research and development costs, procurement costs and an accelerated operational capability? Should the Air Force pursue the rapid development of an improved Tactical Command and Control Sytem utilizing maximum exploitation of currently invested state of the art technology in other services' programs.

Answer: Yes. Compatibility and interoperability with the other Services and our Allies are basic objectives of the Air Force when developing systems to be used in joint operations. Additionally, the Air Force seeks to exploit technology or systems developed by others if they satisfy the Air Force requirement; meet the required operational date better than another alternative(s); and/or save the government money.

PLANS TO USE MARINE CORPS TECHNOLOGY

Question: Please provide to this Committee Air Force plans to utilize the current Marine Corps investment in their Command and Control technology. The Marine Corps program is nearly three years ahead of where a comparable Air Force program would be, if started immediately. Would concurrent development and acquistion assist the Air Force in meeting their operational requirements earlier while saving a significant amount of taxpayer dollars?

Answer: The nature of the Air Force's interest in the Marine Corps TAOC-85 program stems from an AF-validated requirement to improve the Forward Air Control Post (FACP) element of the Tactical Air Control System. In an effort to field the required capability at the earliest possible date, Headquarters Air Force tasked Air Force Systems Command and Tactical Air Command to study and evaluate on-going programs as candidates to satisfy the FACP requirement. Three systems met the study criteria. Of the three, the Marine Corps TAOC-85 system was judged to be most capable of meeting the overall requirement for an improved FACP. The Air Force has considerable interest in TAOC-85. The evaluation showed that, as presently configured, the TAOC-85 meets about 75 percent of the Air Force requirement. Recently, the Air Force has asked the developing contractor (through the Marine Corps) specifically what changes would be necessary in TAOC-85 to meet Air Force requirements. The study is to be completed by 1 Oct 81. If the study shows that the changes to TAOC-85 are feasible, it appears that approximately two years development time could be saved if FY 82 funds were made available. Firm cost savings cannot be determined at this time because development and acquisition costs associated with an Air Force only alternative are not currently available. However, it appears that a joint program development has the potential to achieve significant savings for the government.

SUBCOMMITTEE RECESS

The subcommittee will stand in recess until Wednesday, May 13 at 9:30 a.m. when we will meet to receive testimony regarding the fiscal year 1982 budget request for Air Force Manpower and Reserve Forces.

[Whereupon, at 10:04 a.m., Thursday, May 7, the subcommittee was recessed to reconvene at 9:30 a.m. Wednesday, May 13.]

LIST OF WITNESSES, COMMUNICATIONS, AND PREPARED STATEMENTS

Page

Burke, Lt. Gen. Kelly H., Deputy Chief of Staff, Research, Development and Acquisition, U.S. Air Force 615
  Prepared statement 617

Cann, Gerald A., Acting Assistant Secretary of the Navy (Research, Engineering and Systems) Department of the Navy 527
  Prepared statement 533

Daoulas, Arthur, Acting Assistant Secretary of the Army (Research, Development and Acquisition), Department of Defense 135
  Biographical sketch 137
  Prepared statement 136

Fossum, Dr. Robert R., Director, Defense Advanced Research Projects Agency (DARPA) 1
  Prepared statement 26
Fowler, Vice Adm. Earl B., USN, Commander, Naval Sea Systems Command, Department of the Navy 295
  Biographical sketch 380
  Prepared statement 354

Hardison, David C., Deputy Under Secretary of Defense for Research and Engineering (Tactical Warfare Programs) Department of Defense 1
Hooper, Ms. Beverly J., Acting Director of Combat Support Programs Division, Directorate of Logistics Plans and Programs, Deputy Chief of Staff, Logistics and Engineering, U.S. Air Force 615

Jacobson, Brig. Gen. Ralph H., USAF, Director of Space Systems and Command, Control, Communications, Deputy Chief of Staff, Research, Development and Acquisition, U.S. Air Force 615

Keith, Lt. Gen. Donald R., USA, Deputy Chief of Staff for Research, Development and Acquisition, Department of Defense 135
  Biographical sketch 245
  Prepared statements 139, 192

Marshall, Maj. Gen. James H., USAF, Director of Development and Production, Deputy Chief of Staff, Research, Development and Acquisition, U.S. Air Force 615
McDonald, Vice Adm. Wesley L., USN, Deputy Chief of Naval Operations (Air Warfare) Department of the Navy 295, 417
  Prepared statement 440
McMillan, William A., Special Assistant for Congressional Coordination to the Director, R.D.T. & E., Office of the Chief of Naval Operations, Department of the Navy 527
Miller, Rear Adm. Richard A., USN, Director of Budgets and Reports, Department of the Navy 417, 527
Monroe, Vice Adm. Robert R., USN, Director, Research, Development, Test and Evaluation, Department of the Navy 527

Page

Moore, Brig. Gen. Jacob W., USMC, Deputy Chief of Staff, Research, Development and Studies, Headquarters, U.S. Marine Corps 527
  Prepared statement 563

Roane, Rear Adm. Donald P., USN, Director, Surface Combatant Systems Division, Office of the Chief of Naval Operations, Department of the Navy 469
  Prepared statement 496
Rowden, Vice Adm. William H., USN, Deputy Chief of Naval Operations (Surface Warfare) Department of the Navy 295
  Biographical sketch 353
  Prepared statement 301
Russ, Maj. Gen. Robert D., USAF, Director of Operational Requirements, Deputy Chief of Staff, Research, Development and Acquisition, U.S. Air Force 615

Seymour, Vice Adm. Ernest R., USN, Commander, Naval Air Systems Command, Department of the Navy 417, 527
Stark, Cmdr. John W., USN, Head, Budget and Legislation Section of Aviation, Plans and Requirements Division, Department of the Navy 417

Uher, Col. Edward L., USAF, Deputy Director of Logistics Plan and Programs, Deputy Chief of Staff, Logistics and Engineering, U.S. Air Force 615

Wade, Hon. James P., Jr., Acting Principal Deputy Under Secretary for Research and Engineering, Department of Defense 1
  Prepared statement 11
White, Lt. Gen. William J., USMC, Deputy Chief of Staff for Aviation, U.S. Marine Corps 417, 458
  Prepared statement 464
Wilkinson, Rear Adm. Joseph B., USN, Deputy Commander for Plans and Programs, Naval Air Systems Command, Department of the Navy 417

CHARTS AND ILLUSTRATIONS

DEPARTMENT OF DEFENSE

Page
Agency manpower and funding profile (DARPA) 24
Budget trends (actual then-year dollars) (DARPA) 22
Investment strategy (DARPA) 21
Missile options 125
Presentation summary (DARPA) 18
Reporting flow chart (DARPA) 20

DEPARTMENT OF THE AIR FORCE

Aircraft request by dollar breakdown 719
Budget breakdown, pie chart 713
Cargo aircraft payload and range 752
Fiscal 1982 budget priorities 709
Frontal aviation force levels 706
General purpose forces 712
Investment balance, aircraft and missile procurement 715
MIG-23/Flogger 707
Military investment comparison, U.S./U.S.S.R 703
Missile procurement purchasing power 720
Missile request by dollar breakdown 721
Operating vs. investment funding 714
Other procurement by dollar breakdown 723
Other procurement purchasing power 722
Procurement purchasing power 718
R. & D. budget pie chart 724
R.D.T. & E. budget 716
R.D.T. & E. budget trends 725
R.D.T. & E. dollar breakdown 717
Readiness/sustainability priorities 711
Response to Soviet threat 701
Soviet military capability 702, 704, 708
Strategic force priorities 710
Tactical fighter production 705

DEPARTMENT OF THE ARMY

AAH advanced attack helicopter 207, 209
Air defense systems 151
AN/TPQ 36 and 37, radar systems 221
Aviation systems 154
BCS battery computer system 218
BLACK HAWK helicopter 234, 235
BLACK HAWK synthetic flight trainer 242
C^{3}I systems 157
CH-47D Chinook helicopter 236
CHAPARRAL missile system 226
Close combat systems 144

Page
COBRA/TOW attack helicopter ... 206
COPPERHEAD cannon-launched, laser-guided 155mm howitzer projectile ... 213
DIVAD division air defense gun ... 228
Fire support systems ... 148
FISTV fire support team vehicle ... 223
GEMSS ground-emplaced mine scattering system ... 212
GLLD ground laser locator designator ... 222
GUARDRAIL V airborne/ground intelligence system ... 232
I-HAWK missile system ... 226
IFV infantry fighting vehicle ... 204
ITV improved TOW vehicle ... 210
M60A3 tank ... 204
M113A2 armored personnel carrier ... 205
M198, 155mm towed howitzer ... 217
MLRS multiple launch rocket system ... 216
PATRIOT missile system ... 225
PERSHING II missile system ... 215
PLRS position locating reporting system ... 231
QUICK FIX airborne offensive communications intercept and jamming system ... 233
QUICK LOOK II airborne computer controlled system ... 233
ROLAND missile system ... 227
RPV remotely piloted vehicle ... 221
SADARM anti-tank weapon system ... 201
SOTAS standoff target acquisition system ... 220
STINGER anti-aircraft missile ... 228
TACFIRE fire direction system ... 218
TOW anti-tank weapon ... 210
The Threat, quantity, quality, and capacity issues ... 141
TRI-TAC joint tactical communications program ... 229
VIPER anti-tank rocket ... 211
XM-736 binary projectile (8-in.) ... 240
XM-1 Abrams tank ... 202, 203

DEPARTMENT OF THE NAVY

Aerial targets ... 517
Aircraft attrition ... 421
Aircraft carriers (assuming SCN through fiscal 1981) ... 307
Aircraft procurement ... 422
Ammunition ships (AE/TAE) (assuming SCN through fiscal 1981) ... 318
Amphibious lift ... 321
AO/TAO (assuming SCN through fiscal 1981) ... 317
AOE/AOR (assuming SCN through fiscal 1981) ... 316
ASW destroyers (assuming SCN through fiscal 1981) ... 310
Attack submarine force levels (assuming SCN through fiscal 1981) ... 305
Auxiliary lighterage ships TALS (acquisition) ... 347
Average total employment, all naval shipyards ... 378
Battleship BB reactivation ... 336
Budget breakdown, by pie chart ... 529
CAPTOR ASW mine ... 520
Carrier service life extension (CV SLEP) ... 332
Combat stores ship TAFS (acquisition) ... 344
Combat/stores ships (assuming SCN through fiscal 1981) ... 320
Comparative delivery assessment ... 356
Craft (fiscal 1982 amended) ... 351
Cruisers/guided missile destroyers, composite ... 312
CV reactivation ... 333
CVN-nuclear carrier ... 331

Page
Deployable ships (assumes SCN through fiscal 1986) 297
DON aviation force requirements 419
Drawing revisions per drawing for various classes of ships 364
Electric Boat Division, delivery schedules, SSN-688 class 364
Electric Boat Division, delivery schedules, TRIDENT 364
Employment in private shipyards, workload forecast 373
Engine program cost increases 540
F/A-18 Hornet 427
Fast logistic ship TAKRX (C) conversion 350
Fiscal 1982 budget request, escalation and cost growth 370
Fiscal 1982 request, bar chart on cost growth 371
Fiscal 1982 shipbuilding and conversion budget, items in millions 299, 327
Five-year plans, Carter/Ford budgets, fiscal year 1978 326
Five-year shipbuilding program 372
Fleet oiler (TAO) 342
Fleet size projected to 1994 302
Force composition 296
Frigates (FF/FFG) (assuming SCN through fiscal 1981) 314
Guided missile cruiser (CG-47 class) 334
Guided missile cruiser/destroyer and ASW destroyer (CG/CGN/DDG/DD) (assuming SCN through fiscal 1981) 313
Guided missile frigate (FFG 7 class) 337
HARM radar-destroying missile 514
HARPOON antiship cruise missile 509
HARPOON cruise missile 471
Hospital ship—TAH (conversion) 343
LAMPS Mark III helicopter 437
LAMPS MK III cost increases 540
Landing craft air cushion (LCAC) (assuming SCN through fiscal 1981) 323
Landing ship dock (LSD-41 class) 338
LASER MAVERICK air-to-surface missiles 473, 513
Major private shipyards and current construction assignments 374
Marad forecast, 5-year 372
Maritime pre-positioning ship TAKX (new construction) 348
Maritime pre-positioning ship TAKX (C) (conversion) 349
Mine countermeasures ship (MCM) 340
Mine countermeasures ships (assuming SCN through fiscal 1981) 325
MK-30 mobile target 521
MK-38 mine mobile target 522
MK-46 (neartip) torpedo 475, 519
MK-48 torpedo 518
MK-75/76mm gun mount 524
New construction ships deliveries by naval shipyards 379
New construction ships under contract as of March 1, 1981 355
Newport News shipbuilding, SSN-688 class delivery schedules 367
Notional ship capability/characteristics 322
Ocean surveillance ship (TAGOS) 345
Other shipbuilding (in millions of dollars) 352
PHALANX close-in weapons system 523
PHOENIX air-to-air missile 472
PHOENIX all-weather missile 512
Public shipyards 377
Salvage ship—ARS 341
SEASTATE 5 helicopter 438
Shipbuilding and shipyards 354
SIDEWINDER, infrared homing air-to-air missile 511
SLBM launcher levels 304
SPARROW all-weather missile 510
SSN-688 class nuclear powered attack submarine 329

Page
STANDARD MISSILE-ER surface-to-air guided missile 474, 516
STANDARD MISSILE-ER surface-to-air missile 515
Surface combatant force level 309
TACAIR wing composition 420
TOMAHAWK cruise missile 508
TRIDENT and SSN-688 class submarine authorizations 357
TRIDENT fleet ballistic missile submarine 328
TRIDENT strategic missile 470
TRIDENT undersea ballistic missile 507

SUBJECT INDEX

DEPARTMENT OF DEFENSE

Page

- Advanced attack helicopter (AAH) 122
- Aircraft carrier *Oriskany* 86
- Aircraft procurement 8
- B-1 bomber 68
  - ECM and EMP testing 118
  - Selection and hardware costs 70
  - Superiority of, over B-52 83
  - Trestle test of 118
- Battleship conversions:
  - *Iowa* 79, 86
  - *Missouri* 87
  - *New Jersey* 79, 86
  - Survivability of 80, 82
  - *Wisconsin* 87
- Budget request 1, 68
- C-X cargo aircraft 70, 75, 126
- Chiles, Hon. Lawton, U.S. Senator from Florida, questions submitted by 131
- Defense Advanced Research Projects Agency:
  - Advanced cruise missile (CM) program 28, 40
  - Air vehicles and weapons 26, 35
  - Basic research, decrease in 22
  - Budget trends 22, 63
  - Command, control, and communication (C^3) 27, 37
  - Description 18
  - Exploratory development 23
  - Intermediate term projects 89
  - Investment strategy 21
  - Land combat 28, 42
  - Major thrust description 66
  - Manpower and funding profile 24
  - NASA, liaison with 79
  - Naval warfare 26, 33
  - Nuclear test verification technology 29, 46
  - Program element funding summary 65
  - Reporting status 20
  - Space defense technology 30, 47
  - Space surveillance 30, 51
  - Technology initiatives 31, 54
  - Terminated programs 63
  - Transferred programs 61
  - Unified and specified command assistance 60
  - Very large scale integrated circuit system (VLSI) 130
- Defense industrial base 117
- Defense production base 116
- ELF system:
  - Deployment of 73, 87

78-119 0 - 81 - 50

Page
Engine model derivative program (EMDP) 131
F/A-18 aircraft 119
F-15 aircraft 88
F-16 aircraft 88
FB-111 aircraft 83
General purpose forces 8, 15
Hardware acquisition 74
Hatfield, Hon. Mark O., U.S. Senator from Oregon, questions submitted by 114
Industrial base productivity 9, 16
Inflation vs. real growth increases 91
Investment strategy 5, 11, 13
IR & D/B & P costs 112
JP-233 low altitude airfield attack system 120, 121
Laser system development:
  Funding for 77, 126
Lightweight armored vehicles 121
M-1 tank 69
M-X missile:
  ABM defense of 71
  Cost effectiveness of 76
  Military prime contracts, universities receiving 92
Missile systems development 88
Multiyear contracting 119
Naval tactical air 8
Overspecification and high performance standards 116
Particle beam technology 78, 129
Product and component civilianization 115
Research, development and acquisition, emphasis on 6, 14
Schmitt, Hon. Harrison, U.S. Senator from New Mexico, questions submitted by 118
Soviet naval surface ships 81
Standards and specifications excesses 114
Stealth bomber program 82
Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by 118
Stevens, Hon. Ted, U.S. Senator from Alaska, questions submitted by 91
Strategic forces 7
Strategic modernization 6, 14, 68
Subcontractor deficiencies 117
Submarine systems 7
Target acquisition designation sight 122
TRIDENT II missile 123
U.S./ROK forces 89
U.S./Soviet comparisons:
  Defense effort 3
  Investments 2
  Production capabilities 3, 12
  Quality/quantity 4, 12
  Technology 4, 12

DEPARTMENT OF THE AIR FORCE

Aircraft and missile procurement:
  Aircraft purchasing power 718
  Close air support/battlefield interdiction 664
  Command, control, and communications 673
  Counterair 666
  Defense suppression 668
  Defense-wide management and support 676
  Inflation rates 752
  Mobility 670
  Other 671
  Procurement estimates 688

Aircraft and missile procurement—Continued ..... Page
  Program management 683
    Acquisition management 684
    Technology planning 683
  Readiness 679
    Aircraft common ground equipment 681
    Missile and aircraft spares and repair parts 679
    Simulators 681
    War consumables 680
    Weapons procurement 682
  Reconnaissance 669
  Space programs 671
  Strategic defense 663
  Strategic offense 658
    Bomber force 661
    Land-based ICBMs 659
  Missile purchasing power 720
Airport runway interdiction 757
ALCM air launched cruise missile program 739, 755, 763
Armstrong, Hon. William L., U.S. Senator from Colorado, questions submitted by 768
Avionics, civilian electronics contribution to 760
AWACS 744, 754, 772
B-1 variant 747, 748
B-52 companion trainer program 754
Budget request 615, 709, 713, 716, 724
C-X program 737, 752
Civilian Boeing 707, military uses for 741, 766
Combat aircraft, dollar breakdown 719
Consolidated Space Operations Center:
  Role and functions of 736
CRAF civilian reserve air fleet 751
Design specifications, scrutinizing of 745
EC-135 aircraft 766
F-5 aircraft 767
F-15 engine problems 742
F-100 spare engine pool 743
F-101X development 760, 762
FB-111B/C 747
GATOR mine testing status 764
General purpose forces 712
GLCM ground launched cruise missile 755
"Gold plated" weapons systems 761
Hatfield, Hon. Mark O., U.S. Senator from Oregon, questions submitted by 756
High technology systems:
  Cost growth 731
  Inflation rates of 725
Intelligence programs, purchasing power of 721
IUS inertial upper stage project, NASA withdrawal from 765
KC-135 re-engining program 740, 751, 767
LRCA long range combat aircraft program 748
M-X missile basing 749
Military investment comparison, U.S./U.S.S.R., NIE chart on 703
MINUTEMAN missile funding 754
MOD KIT procurement 764
NGT next generation trainer 762
Off-the-shelf items 757
Operating vs. investment funds 714
Other procurement:
  Activity 692
  Air Force communications 698

- Other procurement—Continued — Page
  - Base maintenance support 696
  - Base support equipment 700
  - Bombs 694
  - Cargo utility vehicles 695
  - Cartridges 693
  - Communications security equipment 697
  - Defense Communications Agency program 698
  - Depot plant and materials handling equipment 700
  - Electrical equipment 700
  - Electronics programs 697
  - Firefighting vehicles 696
  - Fuzes 694
  - Intelligence programs 697
  - Materials handling equipment 696
  - Modifications 698
  - Organization and base 698
  - Other items 694
  - Other weapons 694
  - Passenger carrying vehicles 695
  - Personal safety and rescue equipment 699
  - Purchasing power 722
  - Rockets and launchers 693
  - Special communications/electronics projects 697
  - Special purpose vehicles 695
  - Special support projects 701
  - Targets 694
  - Test equipment 699
- R. & D. vs. procurement spending ratio 715
- Research, Development, Test and Evaluation:
  - Air-to-surface attack 625, 650
  - Command, control, and communications 631, 652
  - Counterair 628, 650
  - Defense suppression 628, 650
  - Dollar breakdown 717
  - Management, support, and defensewide systems 641, 654
  - Mobility 630, 651
  - Program management 643
    - Acquisition management 644
    - Technology planning 643
  - Reconnaissance 629, 650
  - Space systems 630, 651
  - Strategic defense 622, 649
    - Atmospheric warning and defense 623
    - Missile surveillance and warning 623
    - Other strategic defense 625
    - Space surveillance and defense 624
  - Strategic offense 618, 649
    - Bomber leg of TRIAD 621
    - Land-based ICBMs 619
  - Technology base 634, 653
    - Functional areas 637
    - Summary 641
- Soviet threat, U.S. response to 701
- Space Shuttle:
  - Launch: role and payload 733
- Spares account increase 711
- Standoff ranges of weapons 761
- Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by 762
- Stevens, Hon. Ted, U.S. Senator from Alaska, questions submitted by 747
- Strategic force priorities 710

Page
Strategic materials analysis ... 726
 National defense stockpile ... 727
Strategic minerals dependence ... 730
T-34C shortcomings ... 763
T-37 service life extension ... 763
Tactical command and control ... 768
TACS tactical air control system ... 769
U.S.S.R.:
 Frontal aviation forces ... 706
 MIG-23/Flogger ... 707
 Military capability ... 704
 Strategic nuclear force capability ... 708
 Tactical fighter production ... 705
War reserve stocks ... 756

DEPARTMENT OF THE ARMY

AAH advanced attack helicopter ... 154, 155, 186, 207, 249, 275
ACVT armored combat vehicle test, joint program ... 278
Administrative use vehicles ... 264
AH-1S COBRA-TOW helicopter ... 206, 208
AHIP Army helicopter improvement program ... 154, 156, 187, 208, 274
Ammunition material handling equipment ... 267
AN/TPQ-37 counterbattery radar ... 148, 150, 178, 221
ARMBRUST weapon system ... 171, 277
Assault breaker program ... 280
Balanced forces concept ... 136
Ballistic missile defense ... 242
BCS battery computer system ... 218, 278
BLACK HAWK utility helicopter ... 154, 156, 188, 234, 249
 Synthetic flight trainer ... 242
"Bow-wave" problem ... 195
Bridging ... 259
Budget request ... 135, 246
Carter administration fiscal 1982 budget, mission areas reflected under ... 262
CEWI combat electronic warfare and intelligence units ... 269
CH-47D Chinook, medium lift helicopter ... 154, 156, 188, 236
CHAPARRAL short-range, air defense missile system ... 151, 152, 182, 226
Chemical warfare ... 240
Close combat ... 164
Combined arms battlefield ... 163
Command, control, communications, and intelligence ... 229, 251
Commercial products procurement ... 290
COPPERHEAD indirect fire precision guided munition ... 148, 149, 176, 213, 222
CSWS Corps support weapon system ... 148, 149, 175
D'Amato, Hon. Alfonse M., U.S. Senator from New York, questions submitted by ... 264
Desert shields for helicopters ... 190
DIVAD division air defense gun ... 151, 153, 183, 227, 282
Eagleton, Hon. Thomas F., U.S. Senator from Missouri, questions submitted by ... 285
FISTV fire support team vehicle ... 148, 150, 177, 222
GEMSS ground-emplaced mine scattering system ... 212
GLLD ground laser locator designtor ... 148, 150, 177, 222
GUARDRAIL V airborne/ground intelligence system ... 232
Hatfield, Hon. Mark O., U.S. Senator from Oregon, questions submitted by ... 289
HELLFIRE air-to-ground missile ... 154, 155, 209, 222, 249, 275
High technology test bed program ... 279
HIND ground attack helicopter ... 179, 183
HMMWV high mobility, multipurpose wheeled vehicle ... 260
HOE homing overlay experiment ... 244

Page
I-HAWK low to medium altitude air defense missile system ... 151, 152, 182, 225
IFV infantry and cavalry fighting vehicle (FVS) ... 144, 145, 168, 204, 264
ITV improved TOW vehicle ... 210
Julie Research Laboratory bid ... 271
KMR Kwajalein missile range ... 244
LANCE missile system ... 214
LDS layered defense system ... 243
LoAD low altitude defense system ... 243
M-1 Abrams tank ... 144, 145, 165, 202, 248, 281, 285
M-9 armored combat earthmover ... 212
M-48 tank modifications ... 265
M-60A3 (MODS) tank ... 144, 145, 167, 204, 248
M-109, 155mm self-propelled system, noise level ... 173, 216
M-113A2 armored personnel carrier ... 205
M-198, 155mm towed Howitzer, noise levels ... 173, 216
Medical research ... 239
Mine emplacing ... 258
MLRS multiple launch rocket system ... 148, 149, 215
MOBEX 80 mobilization exercise, recommendations for improving industrial base ... 198
MOPMS modular pack mine system ... 219
Multiyear contracting ... 284
New equipment ... 241
New York Army National Guard units, shortages in ... 269
Offensive electronic warfare operations ... 231
ORATMS off-route antitank mine system ... 219
PATRIOT long-range missile system ... 151, 152, 179, 224
PAVE MOVER radar program ... 273
PERSHING II missile system ... 148, 149 174, 214
PIVADS product improved Vulcan air defense system ... 282
PLRS position locating reporting system ... 157, 159, 231, 252
PLRS/JTIDS (ADDS) joint tactical information distribution system ... 157, 159
POL petroleum, oil, and lubrication ... 261
Programwide management and support/R.D.T. & E. management ... 237
QUICK FIX airborne offensive communications intercept ... 233
QUICK LOOK II airborne computer controlled system ... 233
Radio jamming assets ... 234
ROLAND all-weather, short range air defense missile system ... 151, 153, 184, 227
RPV remotely-piloted vehicle ... 157, 160, 220, 257
SADARM search and destroy armor concept ... 201, 219
SIGMA concept ... 231
SINCGARS single channel ground and radio system ... 157, 158, 230, 251
Small arms requirements ... 266
SOTAS standoff target acquisition system ... 157, 159, 220, 253, 273, 284
  Alternatives ... 256
  Cost-effective analysis ... 255
STANO surveillance, target acquisition, and night observation ... 219, 223
Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by ... 273
STINGER shoulder-fired, antiaircraft missile ... 151, 153, 185, 228, 281
Stevens, Hon. Ted, U.S. Senator from Alaska, questions submitted by ... 246
TACFIRE fire direction system ... 217
TACSATCOM tactical satellite communications ... 157, 159, 252
Tank-antitank warfare ... 200
Technology base ... 238
TMDE test, measurement and diagnostic equipment, calibration and repair of ... 270
TOW II (tube-launched, optically-tracked, wire guided) missile.. 144, 146, 169, 170, 209
TRI-TAC joint tactical communications program ... 157, 158, 229, 251
Truck shortages ... 259

Page
U.S.S.R.:
  Tank force, status of ... 164, 200
  Trends ... 193
VIPER antitank weapon system ... 144, 146, 171, 211, 277
Noise level ... 173
WWMCCS worldwide military command and control system ... 267

DEPARTMENT OF THE NAVY

SHIPBUILDING AND CONVERSION

AE/TAE ammunition ships ... 315
AEGIS cruiser program ... 410
AFS/TAF combat stores ships ... 299, 319
Aircraft carrier (CV) ... 299, 306, 330
Aircraft carrier (CVN) ... 299, 306, 330
Aircraft carrier SLEP (CV-SLEP) ... 299, 330
Amphibious forces ... 319
AO/TAO oilers ... 315
AOR/AOE multiproduct station ships ... 315
Attack submarine (SSN-688) ... 299, 303, 324, 329
Auxiliary lighterage ship (TALS) ... 299, 346
Battleship reactivation:
  Cost estimates ... 386, 390
  Cruise missile use on battleships ... 387
  Iowa ... 297, 335, 396, 409
  Missouri ... 297
  New Jersey ... 297, 335, 396, 409
  Proposals for ... 385, 392
  Wisconsin ... 297
Budget request ... 295
Combat stores ship TAFS ... 339
Construction/repair facilities ... 401
Craft:
  Landing craft medium (LCM) ... 346
  Landing craft personnel (large) LCPL ... 346
  Special warfare craft (light) SWCL ... 346
Cruise missiles, use on surface ships of ... 389, 393
DD-963 class ships, armor plating program for ... 410
Electric Boat, shipbuilding status at ... 357
  Construction problems ... 403
  Delay costs ... 366, 404
  Delivery schedules ... 364
  Insurance ... 366
  Quality control factors ... 405
Escalation and cost growth ... 369
Fast logistic ship (TAKRX) ... 299, 346
Fleet oiler (TAO) ... 299, 339
Force planning ... 301
Guided missile cruiser (CG-47) ... 299, 330
Guided missile frigate (FFG-7) ... 299, 335
Hospital ship (TAH) ... 299, 339
Industry/government coordination ... 402
LAMPS MK I ASW mission ... 416
Landing ship dock (LSD) ... 299, 335
LCAC landing craft air cushion ... 323, 346
POLARIS/POSEIDON submarine force ... 303
Marad shipbuilding forecast ... 372
Mare Island, submarine construction at ... 406
Maritime pre-positioning ship (TAKX) ... 299, 346
Mine countermeasures ship (MCM) ... 299, 335
Mine warfare forces ... 319

Page
MLSF mobile logistics support forces ... 311
Mothballed fleet ... 386
New ship construction ... 398
Newport News shipbuilding ... 367
Notional ship capability characteristics ... 322
Ocean surveillance ship (TAGOS) ... 299, 339
Offensive Navy, development of ... 296
Oriskany:
  Characteristics ... 384
  Cost estimates for ... 391
  Deactivation and retirement ... 383
  Operational role ... 384
  Reactivation of ... 381
Other shipbuilding ... 352
Portsmouth, N.H. shipyard, performance at ... 405
RO/RO roll-on/roll-off vessels ... 409
Salvage ship (ARS) ... 299, 339
Shipyards, new construction ships under contract to ... 355
  Current construction assignments ... 374
  Delivery schedules ... 356
  Naval shipyards, average total employment ... 378
  Public, location of, map ... 377
  Shipyard capacity ... 375
600-ship Navy, progress toward ... 298, 302, 397
Soviet Alpha class submarine ... 406
Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by ... 409
Stevens, Hon. Ted, U.S. Senator from Alaska, questions submitted by ... 396
Surface combatant forces ... 306, 309
SURTASS surveillance towed array sensor program ... 415
Titanium capabilities ... 407
TRIDENT (SSBN) ... 299, 303, 324, 328, 404
U.S. industrial capacity ... 400
Workload forecast, total employment ... 373

AIRCRAFT AND WEAPONS PROCUREMENT

Aerial targets program ... 501, 517
MK-30 mobile target ... 502
Naval aviation:
  A-6E Intruder ... 422, 444
  Aerospace industry inflation ... 430
    Forecasting escalation ... 432
  Attrition rate ... 421. 478
  Authorized quantities ... 443
  AV-8B ... 422, 423, 446, 491
  C-9B ... 422, 425
  C-2 (VCX) ... 422, 425, 453, 486
  Carrier air wings ... 419
  CH-53E ... 422, 424, 449
  E-2C HAWKEYE ... 422, 425, 452
  EA-6B Prowler ... 422, 445
  EC-130Q TACAMO ... 422, 454
  F-14 ... 422. 424, 447, 480
  F/A-18 ... 422, 427, 448, 480, 484
    Range and development ... 435
    Stress testing program and roll rate ... 434
  Flight training program ... 487
  Force structure ... 419, 441
  LAMPS MK III ... 437, 438, 488
  Modifications ... 455
  Multiyear contracting ... 480

Page

- Naval aviation—Continued
  - P-3C ORION 422, 424, 451
  - Procurement costs and spares, all aircraft 444, 456
  - Readiness 479
  - SEASTATE 5 438
  - SH-2F LAMPS MK I 422, 450, 486
  - SH-3H SEA KING 490
  - SH-60B SEAHAWK 422, 424, 439, 450, 488
  - Support equipment and facilities 456
  - T-34C MENTOR trainer aircraft 422, 423, 425, 454, 487
  - TH-57 SEA RANGER trainer aircraft 422, 423, 454
  - UC-12B 453
  - Wing composition 420
- RDSS rapid deployment surveillance system 492
- Sonobuoy project 492
- Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by 484
- Stevens, Hon. Ted, U.S. Senator from Alaska, questions submitted by 478
- Support equipment and facilities 498
- U.S. Marine Corps:
  - A-6E INTRUDER 461, 465
  - Air-launched antitank weapons 462, 466
  - Aircraft readiness 479
  - AV-8B 458, 464
  - CH-53E 461, 465
  - EA-6B PROWLER 461, 465
  - F/A-18 HORNET 459, 464, 480, 484
  - Fourth Marine Aircraft Wing, reorganization of 468
  - GATOR land mine weapon 467
  - GAU-12/U 25mm gun 467
  - HELLFIRE antitank weapon 466
  - HXM helicopter program 462, 465
  - I-HAWK missile system 467
  - Laser MAVERICK missile 466
  - Laser ZUNI antiarmor weapon 466
  - Mobile air control system 467
  - Multiyear contracting 480
  - Reserve forces 462
  - STINGER surface-to-air missile 467
- Weapons systems:
  - CAPTOR encapsulated torpedo 502, 520
  - Cost growth 482
  - HARM antiradiation missile 500, 514
  - HARPOON antiship cruise missile 471, 483, 499, 509
  - LASER MAVERICK air-to-surface missile 473, 500, 513
  - MK-30 mobile target 521
  - MK-38 mini mobile target 522
  - MK-46 (Neartip) torpedo 475, 502, 519
  - MK-48 torpedo 483, 502, 518
  - MK-75 76mm guns 503, 524
  - PHALANX close-in weapons system 503, 523
  - PHOENIX air-to-air missile 472, 483, 500, 512
  - SEA SPARROW ship-launched missile 473, 499, 510
  - SIDEWINDER air-to-air missile 500, 511
  - STANDARD MISSILE-ER surface-to-air missile 474, 501, 516
  - STANDARD MISSILE-MR 515
  - TACAMO/ELF system 476, 493
  - TOMAHAWK cruise missile 482, 499, 508
  - TRIDENT ballistic missile system 470, 498, 507

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

Page

Acquisition process 530
  Cycle, length of 534
Advanced identification technology 576
ALWT advanced lightweight torpedo 585
ARAPAHO activities 600
ASW antisubmarine standoff weapon 587, 608
AV-8B 25mm gun 537
Blue-green laser program 572
Budget breakdown 528
  Pie chart 529
Clipper bow program 613
Cost problems 546, 579
DDGX destroyer 582
ECM electronic countermeasure 573
ELF program 568, 583, 607
Estimating errors 541
Extending R. & D. process 544
F/A-18 aircraft 537, 558, 577, 581, 599
F-101X engine 612
Fleet AAW/ASW 580
HARM high-speed antiradiation missile 587
HARPOON missile system 539, 572, 606
Hatfield, Hon. Mark O., U.S. Senator from Oregon, questions submitted by 599
Heritage Foundation analysis 601
IWD intermediate water depth mine program 611
LAMPS III program 532, 538, 539, 541, 584
Land-based test sites 529
Light carriers 583
Major objectives 533
Management reserve fund 550
Mark-48 torpedo 577
Medium depth mine 588
MK-92 fire control transmitter 585
Multiyear procurement 579
NOSS national ocean satellite system 607
Personnel problems 557
Platform quality and quantity 533
Program development, risk assessment in 545
Program overview 535
Programing threshold 531, 552
RDSS rapidly deployable suveillance system 589
SEAFIRE 610
Ship reactivation:
  Capabilities 575
  Electronic warfare systems for 574
  Iowa 547
  New Jersey 547
  Oriskany 547
  Superstructure protection 549
Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by 603
Stevens, Hon. Ted, U.S. Senator from Alaska, questions submitted by 579
Stretchout program 556
SUBACS submarine advanced combat system 588
Surface missile warhead 570
TOMAHAWK ship attack system 538, 572, 606
TRIDENT ship program 571
U.S. Marine Corps:
  Amphibious assault requirements 592
  F-18 aircraft 560
  FLS field logistics system 566

U.S. Marine Corps—Continued Page
- HXM program ... 591, 612
- JSSAP joint services small arms program ... 605
- LAV light armored vehicle ... 564, 595, 604
- LCAC landing craft air cushion ... 566, 594
- LVT(X) landing vehicle tracked, experimental ... 564
- LVT 7A1 amphibious assault warfare landing vehicle tracked ... 564
- Medium helicopter force deficiencies ... 593
- MIFASS marine integrated fire and air support system ... 565, 590
- MPWS mobile protected weapons system ... 564, 595, 603
- MULE modular universal laser equipment ... 566
- PLRS position location reporting system ... 565
- Purpose, strategy, and programs ... 563
- SEAFIRE system ... 596, 604
- Small arms ... 566
- SMAW shoulder-launched multipurpose assault weapon ... 561, 596
- TAOC tactical air operations control ... 565, 590
- ULS unit level switch ... 565

Vertical launching system ... 538
V/STOL aircraft development ... 599

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